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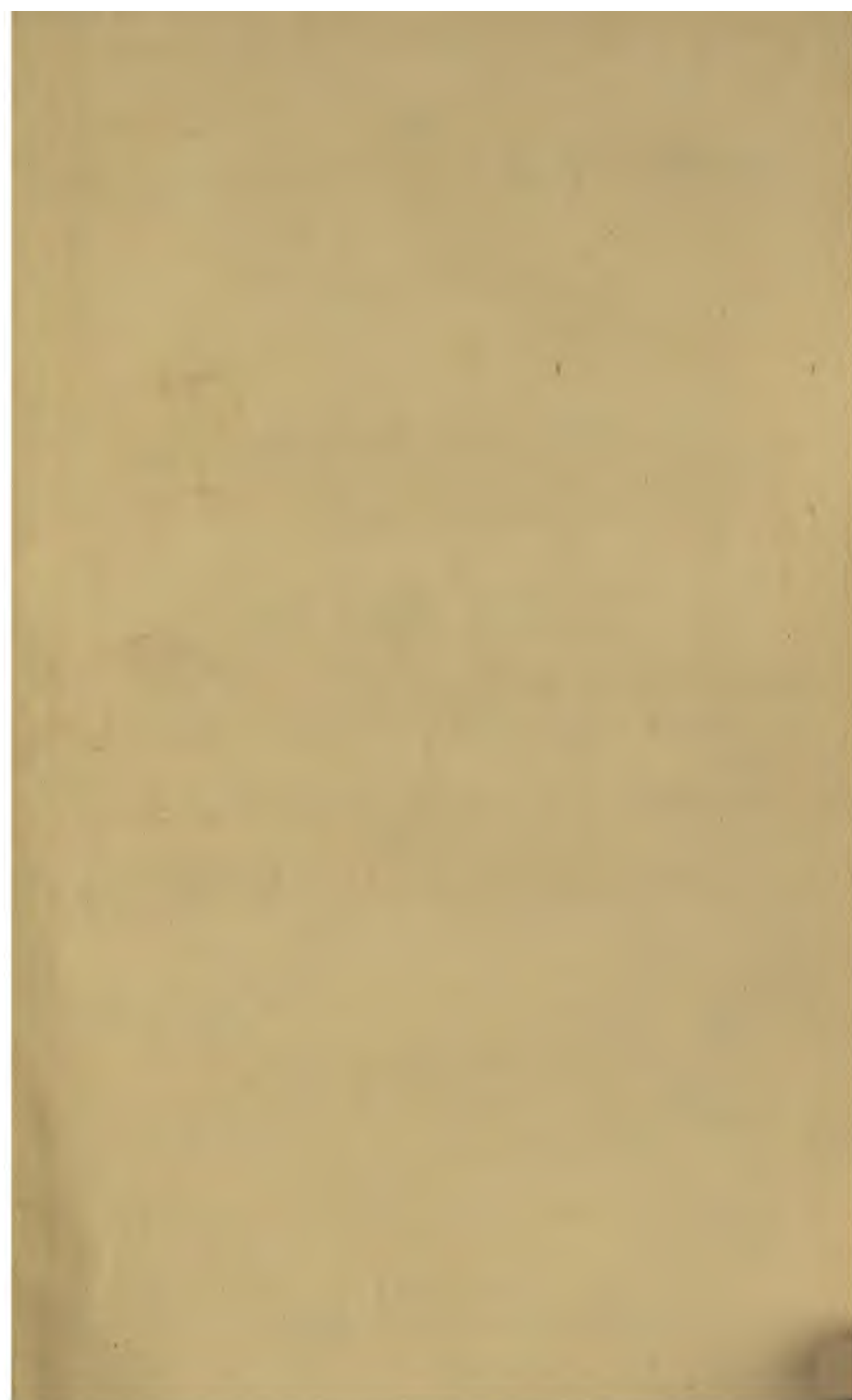


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THE FRUIT OF FORTY YEARS' PROFESSIONAL EXPERIENCE.



ILLUSTRATED WITH PLATES,

BY

CHARLES SEARLE, M.D., M.R.C.S.E.,

AUTHOR OF "CHOLERA, DYSENTERY, AND FEVER—PATHOLOGICALLY
AND PRACTICALLY CONSIDERED." — "AN ESSAY ON THE DISEASES OF EUROPEANS IN
TROPICAL CLIMATES." — "THE PHILOSOPHY OF LIFE, HEALTH, AND DISEASE."
— AND, "THE LIVER, ITS FUNCTIONS AND DISORDERS."

LONDON:
L. BOOTH, 307 REGENT STREET, W.
1860.

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YSAJBU! JHA!

To Critics.—"Do not condemn without reading; and when you read—think; but don't think with your minds prejudiced. There are many things which before we look into them narrowly we take to be different from what they are—and when we do look—we find not what we took them to be!"—LASCARO.

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DEDICATION.

TO THE LIBERAL AND SCIENTIFIC

MEMBERS OF THE MEDICAL PROFESSION,

AND TO SANITARY REFORMERS IN GENERAL.

GENTLEMEN,

A work having for its object the enlightenment of the public mind in relation to the causes and prevention of disease; as well as to the delusions of the charlatan—the dreams of the homœopathist—and the fallacies of a host of incompetent pretenders—who now fatten upon the ignorance and credulity of the public:—

A work written with the view of imparting that amount of knowledge which every one ought to possess on a subject of such pre-eminently personal importance, as that of life and health; and which, too, has for its object the improvement of the science of Medicine and the treatment of Disease—could, I am of opinion, to no one be so appropriately dedicated as to you,—Gentlemen. With this impression, and trusting that it is not undeserving your patronage, I beg leave to submit the work, and have the honour to subscribe myself,

Gentlemen,

Your obedient humble Servant,

C. SEARLE.

To the Reader.—Be not deceived by the Philosophy which is too refined to be comprehended, or too deep to be penetrated :—the Laws of Nature—the only sure foundation of any philosophy—are all simple when understood. Exercise, then, that intuition of Nature—that common sense with which you have been endowed, and accept nothing as *fact*—that bears not upon its surface the impress of truth—and does not bring with it—conviction to your understanding—that it really is such !

SOUND PHILOSOPHY.

PREFACE.

IT is now fourteen years since I published a work on the 'Philosophy of Life, Health, and Disease'—embodying new and original views explanatory of the mysteries of man's existence, and of the laws ordained by Creative Wisdom—by which he moves and thinks—by which he digests food and it sustains life—and, by the observance of which alone, he can hope to enjoy health; or if attacked by disease—by the knowledge they impart, most readily regain health. A work, which the Editor of a critical journal said—was "as interesting as it was instructive"—and which the Editor of the 'Medical Times' did me the honour to say—"was on the whole excellent,—its excellencies such that any man might be proud of, and a work which no ordinary man could have written." My views at that time had not, however, attained to the fulness of their development—they marched up to the threshold of the *sanctum*, but they did not enter the sanctuary,—they traced both health and disease to certain conditions of the blood—but they extended no farther. This, then, is the object I hold in view to rectify—and trust in so doing, have now produced a work, though concise—yet complete in all its parts, which may with truth be designated—a perfect system of medicine—uniting all the scattered fragments of the science into one harmonious whole—in accordance with their mutual dependence and natural affinities.

The work is the fruit of forty years' professional expe-

rience. It professes to be a book of principles—derived from the only rightful source of such an inquiry—the Laws of Nature ; and to be the product of a series of deductions arrived at, by tracing effects to their causes, and causes to their effects—in a consecutive train of reasoning. The views propounded are in principle—true, I believe in all sincerity—in reality I know them to be so ;—but too simple—too true—too readily to be understood, I fear, to meet with the countenance and support of those whose interests are opposed to simplicity, order, and easy comprehension. In principles, I repeat, I am right—perfectly so, though in some particulars, I may not be so correct :—on these I take my stand, and challenge inquiry,—the truth and the truth *only* is what I seek, and desire to see promulgated, from whatever quarter it may be derived. But let not those—whose interests are opposed to the dissemination of knowledge on these subjects among the people—attempt to silence me—as the propounder of new doctrines—by the common subterfuge of little minds—by innuendo, and the exposure of trivial defects,—from which no work is altogether exempt ; in despite of such defects, which I am too conscious the work contains, I know it to be a right valuable one—enunciating principles worthy the attention of the public, and the best consideration of the profession ; and if true—which the fullest conviction of my understanding assures me they are—the whole phenomena of life are now unmasked, and the treatment of every disease brought within the confines of a few general principles—definite in kind, simple in nature, and readily to be understood ;—and which therefore it is right and proper should generally be made known. It is this consideration only, which induces me to publish this work, as I know full well that I must sustain a considerable pecuniary loss by its publication, irrespective of the trouble I have imposed upon myself in its composition ; and as I have relinquished the practice of the profession, I have nothing to gain by any

little ephemeral reputation—should I even attain to it. The pleasure which attends the consciousness of having done what is right—of having fulfilled a public duty from disinterested motives, is the only reward I can hope to reap, and this will be mine whatever the result—success or the want of it—which may attend the publication. I am not, however, insensible to the good opinion of my fellow-man, and as I have done my best to deserve it—I am free to indulge the hope, that I may obtain it.

And now with respect to the work itself, which is founded on the facts—that the blood, developing heat and electricity, (and hence the title—“Thermo-electrical,”)—the animating stimuli of all vital phenomena, is the source of life;—its normal and pure state, developing these stimuli in the required degree, constituting the condition of health,—and its abnormal or vitiated state, developing these—short of the necessities of the system, or in excess of the required degree, occasioning that of disease. If I mistake not I have made it appear,—the laws of Nature being in all cases simple, when known,—that all diseases are allied in character, and consist in a few abnormal conditions of the vessels of nutrition and of the blood’s circulation; and that the derangement of these vessels—affecting one or more of the organs of life, of a part only or of the body generally—constitute the disease essentially, whatever its kind, or wherever located. And if so, the treatment of all may be embraced in a few general principles—definite in kind, though doubtless to be modified in degree, by the constitution and age of the individual, and the particular circumstances of the case; and the subject is moreover simplified in all its relations.

Being of opinion that the principles of the subject are within the comprehension of every intelligent person, and that a distinct knowledge of the principles of any subject is essential to its successful practice; and seeing the lamentable ignorance that exists on these matters, and the char-

latanism which prevails—I have been induced to address myself to the public, rather than to the profession ; with the view of laying open to them—the delusions of incompetent pretenders, and of imparting that amount of knowledge which every individual ought to possess—on a subject of such pre-eminently personal importance—as life and health, and especially so as regards the causes and prevention of disease—and of those calamities of every-day occurrence,—of persons or friends dying by some sudden attack, after a few hours or days of illness ;—calamities which, I am confident, judicious precaution would, with scarcely an exception, have prevented ;—disease, with very few exceptions, being progressive and accumulative in the system :—the enemy giving ample time, while in possession of the outworks, for guarding the citadel within—and thus averting, and in general by very simple means when early resorted to, the more formidable attack !

Nor is there anything in the character of disease itself, which renders it either difficult of comprehension, or necessarily so fatal as daily experience so lamentably exhibits it. Nature, in man's construction, has not put her work out of hand so fragile and incomplete, as to require on his part, anything more than a knowledge of her laws—attention to her admonitions—and the exercise of common prudence to preserve him in health ;—or if attacked by disease, and this is rightly understood, and the operation of remedies so likewise—to be as readily restored to health. But this knowledge is not possessed—the people are led to believe that the subject is beyond their comprehension—and it really is so, so long as it is wrapt up in hard words and mystified language :—and hence from ignorance, they fall ready victims to the delusions of the quack—to the dreams of the homœopathist, and the kindred fallacies of a host of charlatans who now fatten upon their credulity !

In the construction of this work I have done my best to strip the subject of all its obscurity, and explain it in as

simple language as it will admit of—illustrating it with a few plates; and by a consecutive train of reasoning, I have endeavoured to lead the reader, under the guidance of the laws of Nature, and the intuition of his own common sense—from effects to their causes, and contrariwise from causes to their effects—to form his own deductions, and to arrive I hope—at just conclusions:—desiring that, what I advance, may be accorded and accepted by him, no farther than it carries with it the impress of truth, and conviction to his own mind—as the only legitimate claim it can have to his respect. In despite, however, of my best endeavours to render the work deserving acceptance with the public, and the attention of the profession, it will nevertheless be open to objection of some kind, I am fully prepared to expect:—no two of us think alike on any subject. In enunciating, therefore, new principles or views of any kind, however correct they may appear to the author—whose mind is stored with the facts upon which they are based,—it is not to be expected of those wanting this knowledge, that they will immediately see them in the same light, and at once acquiesce in their validity. But, as I have done my best to educe the truth in all cases—I have no fear of the result, although a little time may be required to determine the value of those views and the correctness of them in all their essential particulars.

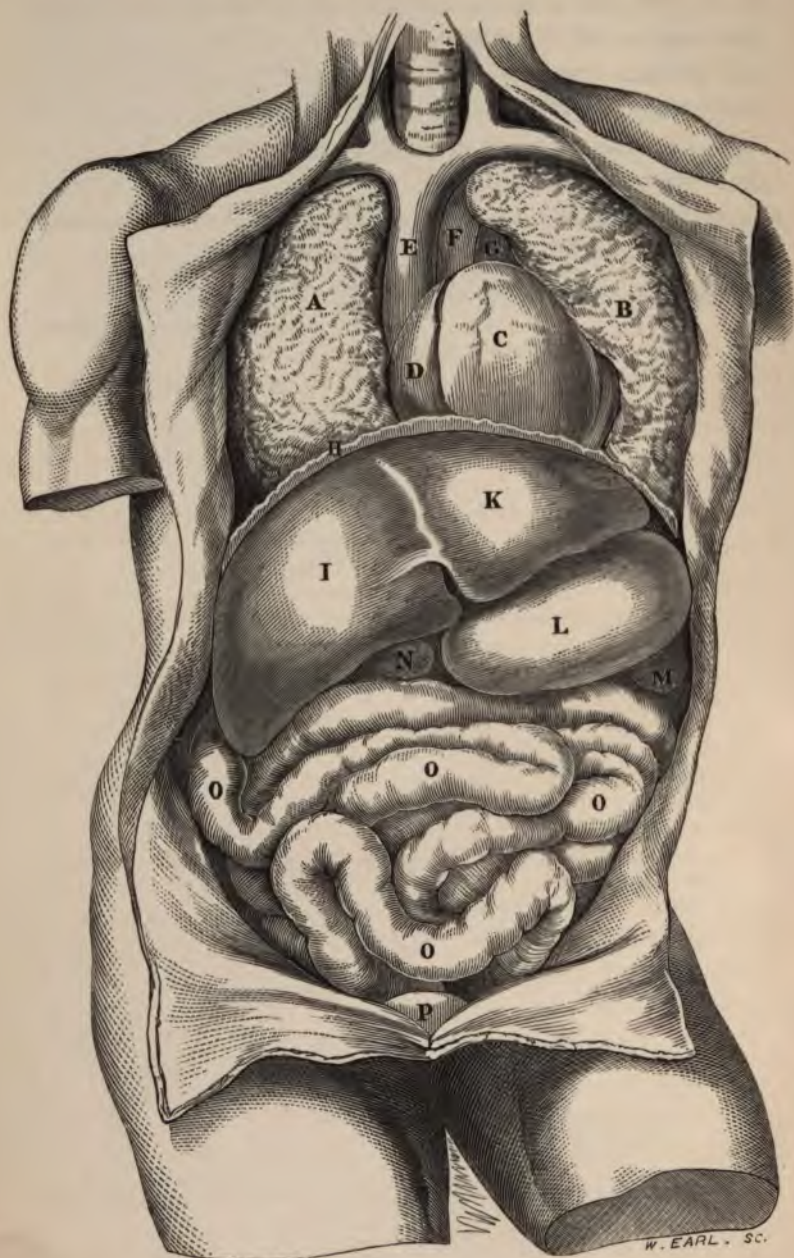
In conclusion, let it be distinctly understood—that however proper it may be—and essential it really is—that every person should fully understand the laws which govern his existence—yet, let it be known, that I am no advocate for every man becoming his own doctor—further than is consistent with his having recourse to simple remedies in the treatment of those every-day ailments to which all are so liable: but, nevertheless, it is both right and proper that he should be acquainted with the constitution and character of disease, and with the operation of the several causes which conspire to produce them: as this knowledge

will best enable him to avoid these causes, or if attacked by disease, enable him to comprehend the principles which should be pursued in its treatment ;—and thus will he be able to judge both as to the propriety of the means, and the competence of those—to whom he may confide his restoration to health—his life—his all !—while both ignorance and quackery—in whatever form it may be disguised, will be put to the blush, and the scientific and qualified be elevated to that position of honour and confidence—their attainments—their trust—their utility and importance, give them such unquestionable right to possess in public estimation.

London, 51 Weymouth Street, Portland Place,
April 1860.

PLATE I.

View of the several organs of the body in their natural positions, as contained in the cavities of the chest and abdomen.



EXPLANATION OF PLATE I.

- A B. The right and left Lungs, occupying, with the Heart and the principal blood-vessels, the whole cavity of the chest.
- C. The Heart enveloped in its bag or covering called pericardium, and supported by the diaphragm, H.
- D. The right Auricle—an appendage to the Heart, which receives the Blood from the veins for distribution to the Lungs.
- E. Superior Vena Cava, or main trunk of the veins from the Head and upper part of the body, bringing blood to the Auricle.
- F. Arch of the Aorta, or main trunk of the Arteries, through which the Heart by its contraction propels the Blood it receives into it from the Lungs to every part of the body.
- G. Pulmonary Artery, conveying the venous Blood to the Lungs for aëration.
- H. Diaphragm or Midriff—a thin, fibrous, muscular expansion, which separates the Chest from the cavity of the Abdomen.
- I K. The Liver separated by the cleft in front into two lobes. It occupies the central regions of the body, the right side, however, more particularly, extending from the Spine and Kidney behind, beneath the Midriff, to which it is suspended, above the Bowels, under the margin of the Ribs in front and across the pit of the Stomach towards the left side, covering in its progress nearly half of the Stomach, which is continued in the same line with it under the margin of the Ribs.
- L. The convex lower surface of the Stomach, tapering from left to right, and covering the Pancreas, which lies behind it.
- M. The Spleen attached to the left end of the Stomach.
- N. The bottom or closed end of the Gall-bladder, seen below the margin of the right lobe of the Liver.
- O O O. Convolutions of the Intestines.
- P. The Urinary Bladder, as seen when distended.

EXPLANATION OF PLATE II.

- A. B. The right and left Lungs, made up of air-tubes and blood-vessels, for the purpose of bringing the air inspired into contact with the blood.
- C. Windpipe, dividing into bronchi or air-tubes for the passage of air to the Lungs.
- D. Right Auricle—an appendage to the Heart for the reception of the venous blood while the Ventricle or body of the heart contracts.
- E. Right Ventricle, which receives the blood into its central cavity from the Auricle, and propels by its contraction the blood through the Lungs for revivification.
- F. Left Auricle, for the reception of the arterial or revitalized blood from the Lungs.
- G. Left Ventricle—which propels the blood it receives from the Auricle through the Aorta to the system in general.
- H H H. Aorta, or main trunk of the Arteries, which, subdividing into innumerable branches, carries the vitalized blood from the Lungs to every part of the body.
- I. Pulmonary Arteries, conveying venous blood to the Lungs.
- K. Pulmonary veins—returning arterialized blood to the Heart for general circulation.
- L. Superior Vena Cava, or main trunk of the Veins from the upper parts of the body, bringing the blood to the Auricle, and thence by the ventricle to the Lungs.
- M M. Inferior Vena Cava, or main trunk of the Veins from the lower parts of the body.
- N. Hepatic or great vein of the Liver, returning the purified venous blood to the general current for transmission to the Lungs.
- O. Stomach or membranous receptacle of food and beverage.
- CE. Gullet, or tube opening into the Stomach connected with the mouth, for the passage of the food and beverage.
- P. Spleen—a spongy organ, attached to the left extremity of the Stomach.
- Q. Pancreas—with its central duct for the passage of its secretion into the intestines.
- R. Liver—its concave surface, with its blood-vessels, gall-bladder and biliary ducts.
- S. The Portal Vein—formed by the junction of the Veins *g, r, s, t, t*, which bring the blood and nutritive juices from the digestive organs to the Liver, for assimilation and purification, or separation of the bile,—which is conveyed by the tubes *o, o* to the gall-bladder, and by the tube *n* to the intestines.
- T T. Intestines or bowels,—a part only is here shown in connexion with the Stomach, receiving the secretions of the Liver and Pancreas; and in display of the blood-vessels which absorb the nutritive juices passing along their surface.
- U U. Kidneys—with the arteries *u, u* bringing blood to them for the secretion of urine; and *v, v* veins returning the purified blood to the general current.
- V V. Ureters or ducts conveying the urine as secreted into the bladder.
- W. Urinary Bladder—penetrated from behind by the ureters.
- X. Prostate Gland—surrounding the neck of the bladder and urethra.
- Y. Part of the Urethra—or duct of exit for the passage of the urine.
- a a*. Carotid Arteries—through which the blood is transmitted to the brain.
- b b*. Subclavian Arteries—through which the blood is transmitted to the chest and arms.
- c c*. Jugular Veins—for the blood's return from the head to the general current.
- d d*. Subclavian Veins—through which the blood returns from the arms and chest.
- e e*. Bronchi or principal divisions of the wind-pipe, proceeding to the Lungs.
- f*. Cæliac Artery—or main trunk of arteries to the digestive organs.
- g*. Hepatic Artery—for supply of arterial blood to nourish the Liver.
- h, i, k, l*. Arteries to the Stomach, Bowels, Spleen, and Pancreas.
- m*. Pancreatic Duct—or tube conveying the secretion of the Pancreas into the Bowels.
- n*. Biliary Duct—conveying the bile from the Gall-bladder and Liver into the intestines.
- o o*. Biliary Ducts—conveying the bile, as it becomes secreted, into the Gall-bladder *p*, and intestines.
- q, r, s, t, t*. The Veins from the Spleen, Stomach, Pancreas, and Bowels, which unite to form the portal-vein and bring the blood, and nutritive juices absorbed from the Stomach and Bowels, to the Liver for purification.
- u u*. Renal Arteries—conveying blood from the aorta to the kidneys for purification.
- v v*. Renal Veins—returning the purified blood to the general current.
- w*. Opening of the Thoracic Duct into the left jugular vein, by which the chyle and fluids absorbed from the Stomach and Bowels are poured into the blood.
- x*. Thoracic Duct—or main trunk of the general system of absorbent vessels.

PLATE II.

A diagrammatic representation of the principal organs of the body when removed from their respective cavities; showing their several connexions, and displaying fully the blood's circulation to the lungs and system in general, and the peculiarities connected with its circulation to the liver.

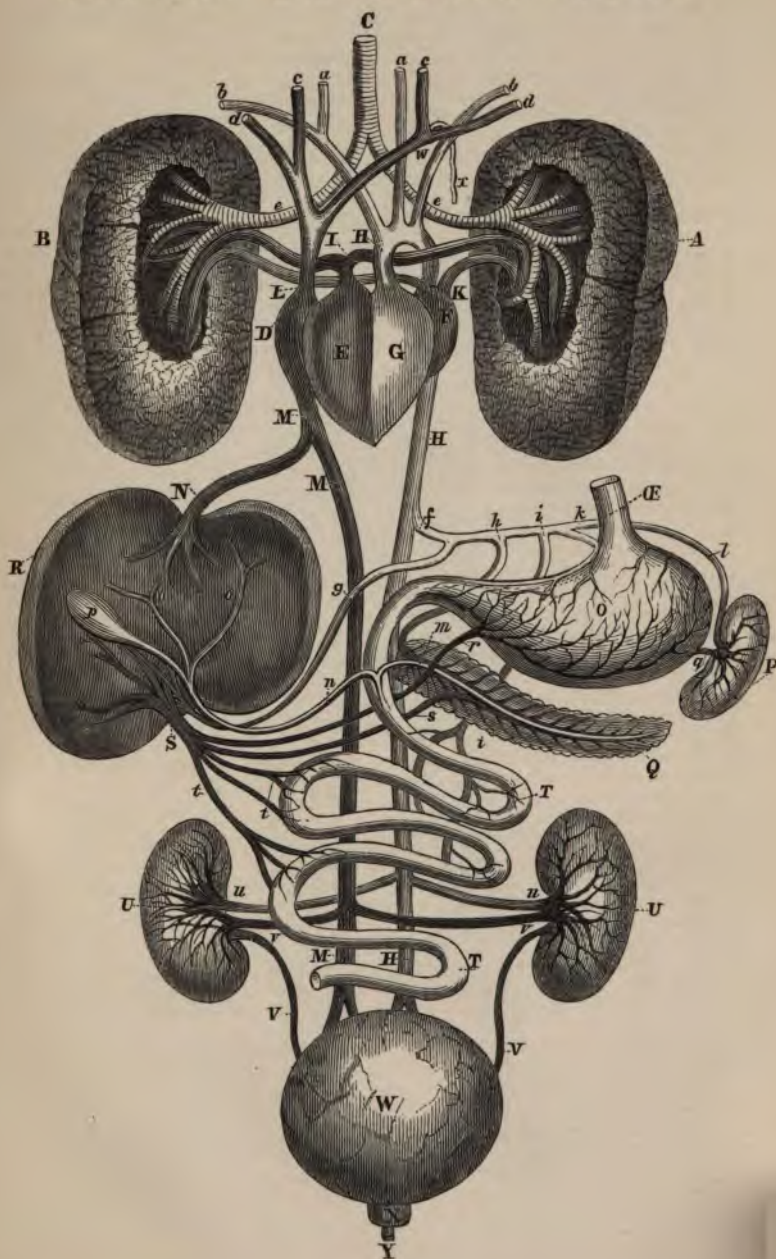
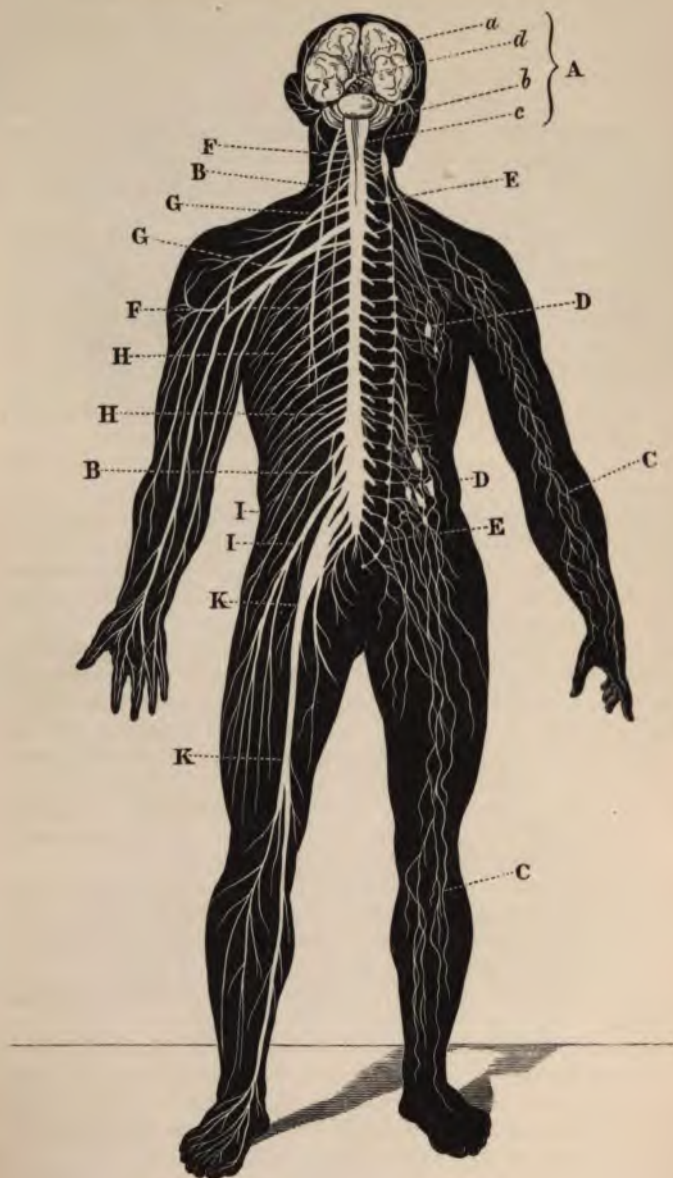


PLATE III.

Diagrammatic view of the Brain and Nervous System.



EXPLANATION OF PLATE III.

ON the right side of the figure the nerves of the ganglionic system are alone represented; and on the left the cerebro-spinal nerves—or those issuing from, or in immediate connexion with the spinal marrow and brain. We have thus separated them for clearness of delineation; but it must be distinctly understood that the spinal column is like the brain—a double organ: and as there are two eyes, so are there two optic nerves; and in like manner, as there are two arms, two legs, and two sides to the body, so are there two sets of nerves in connexion with the spinal marrow, and therefore called spinal nerves, for the supply of those parts with electro-nervous power.

And, again, the ganglionic system in like manner is connected with the spinal, with precisely the same number of nerves on both sides. Had we, therefore, given the natural representation, the two would have appeared, and have unitedly been represented on each side; but as this would have rendered the representation very intricate and difficult of comprehension, we have on this account separated them.

- A. The brain: *a*, the cerebral hemispheres; *b*, the cerebellum; *c*, the medulla oblongata; *d*, the optic nerves—one proceeding to each eye.
- B B. The spinal marrow or prolongation of the brain's substance down the spine.
- C C. The ganglionic nerves, which accompany the blood-vessels in their distribution to the arm and leg, and by which the electricity, as evolved from the blood in the capillary arteries, is brought to the great centres of the ganglionic system, D D, in the abdomen and chest, for distribution to and excitement of the vital organs.
- D D. The great ganglions, with their plexuses or meshes formed by the junction of their nerves with others of the cerebro-spinal system—by which sensation as well as excitement is imparted to the vital organs.
- E E. The long chain of ganglions in more immediate connexion with the cerebro-spinal system, each giving off a filament of nerve to those issuing from the spine.
- F F. The pneumogastric nerve, issuing by its several roots from the summit of the spinal marrow: it is ultimately distributed to the lungs, wind-pipe, and stomach.
- G G. Meshes of nerves formed by the junction of the five nerves issuing from the spine in the neck for distribution to the arm and hand. The meshes thus formed are intended to combine and regulate the motions the nerves impart to the muscles of the arm.
- H H. Nerves imparting sensation and motion to the ribs and abdominal muscles.
- I I. Other nerves of the same description furnished to the hips and thighs.
- K K. The great sciatic nerve—formed by the many issuing from the lower part of the spine, and passing down the back of the thigh, distributing branches to the several muscles on its way—terminates in the numerous twigs it imparts to the foot and toes.



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THE
THERMO-ELECTRICAL SYSTEM
OF MEDICINE;
OR
THE SCIENCE OF
LIFE, HEALTH, AND DISEASE.

INTRODUCTORY OBSERVATIONS.

WHEN we see men of such acknowledged talent as Elliotson, Herbert Mayo, Ashburner, Dickson, and Johnson desert the phalanx of the orthodox practitioners of medicine, and the system of the schools in which they were educated, and of which some of them were accomplished teachers, to flounder in the by-paths of Mesmerism, Homœopathy, Chrono-Thermology, Hydropathy, and fallacies of a kindred nature, it may be fairly inferred that what is considered orthodox by the profession in general, and worthy of all acceptance, is by these gentlemen regarded as fallacious and untenable.

Unsatisfactory in a high degree it assuredly is; for what can be said of a system or structure of any kind without a foundation? of principles of treatment derived from theories of disease based upon assumption only,—the ingenious sophistries of individuals, as Boerhaave, Cullen, Brown, Broussais, the accepted oracles of their day, whose dogmas have been embraced as articles of faith, and constitute the basis of all that is orthodox? Nevertheless, such is the condition of the science of medicine at the present time. It merits not, therefore, the name of a science. A science, to be really such, should have an imperishable foundation—its principles should be founded on the laws of nature, which are immutable in character, and simple when understood. And upon such an adamant foundation of simplicity and truth, in supercession of the chaotic mass of bewilderment and assumption that now exists under the title of medical science, I hope to be able to design a structure which, having both philosophy and common sense for its foundation,

shall prove as permanent as the laws from which it has been derived—those of nature—and upon which alone the natural laws of life, ordained by Creative Wisdom for all time, can any system of medicine, deserving man's acceptance, be successfully raised.

With this intention, before proceeding further, I must observe that every disease consists in some derangement of health ; and as health imports nothing more than the normal or natural condition of life, a knowledge of life, a principle of nature, is, or ought to be, the primary object of our inquiry, as the foundation upon which alone any just reasoning upon the derangements of health (or disease) can be established,—a fact so simple and incontrovertible, that to its validity every man's common sense bears him testimony ; yet, will it be believed, this fact, which stares every man in the face—this natural point of departure—this foundation-stone of the inquiry, upon which alone either the condition of health or that of disease could by any possibility be comprehended—has never, in any one system of medicine which has been accepted by the profession as its rule and guide, as far as my knowledge extends, formed *any part of the inquiry**.

This, then, will accordingly be the first object of our consideration. And we hope soon to make it evident, that caloric and electricity, as the products of certain chemical changes in constant progress in the blood's composition during the course of its circulation, are both evolved from the blood, and constitute the essential stimuli of all vital phenomena ; and that these stimuli, imparting heat and motion—the attributes of life—in connexion with the blood (as the source of these stimuli, nutrition, and all power) in its several conditions of purity or vitiation, are the causes—paramount and immediate—of both health and disease ; and being so regarded, constitute the basis of the system of medical science we are about to enunciate ; and which, from reasons which will now appear obvious, we have thought proper to denominate “Thermo-Electrical.”

The whole fabric of this system of medicine will therefore be found based upon the principles :—that the blood is the *fons et origo vitæ*. That its normal and pure state—developing heat

* It is, however, to Chemistry, a science of to-day, which has opened the eyes of our understanding to the perception of the great laws of nature, to which our present knowledge of life is to be assigned. And to the want of this knowledge, as of light in the midst of darkness, may this apparent neglect herefore be fairly attributed.

and motive power in the required degree and just proportions—constitutes the condition of health; and its abnormal, disordered, or vitiated state constitutes that of disease. That the effects of all external causes of disease and agencies of every description, with perhaps hardly an exception, conduce to this one final result of vitiating the blood—the *origo mali* or operating influence—and develope either congestion, or the passive fulness of the veins; inflammation, or the active excitement of the arteries; or the intermediate condition, that of irritation—which, when partial or confined to a part, constitutes the condition of sub-acute inflammation, and when general, that of fever. That one or other of these conditions—which run into each other by insensible gradations—constitutes the pathological condition or disease virtually, in whatever organ or part located. And that all the various forms in which disease manifests itself, consist in the localization of this, the essential disease, modified in character by the nature of the structure or functions of the part in which it is centralized, and combinations arising out of the derangement of other of the organic functions—which, as a consequence of the first affected, eventually ensue.

Now should this be true—and the sequel, in the explanation afforded of the phenomena of all the principal diseases of the body, irrefragably proves it to be so—the treatment of every disease is necessarily brought within the confines of a few general principles—definite in kind, though doubtless to be modified in degree by the constitution, age, and sex of the individual affected, as well as by the particular cause and circumstances of the case.

And if the treatment of every disease may be thus embraced in a few leading principles, our remedies are necessarily as proportionably reduced in number also, and the subject is simplified in all its relations.

In thus simplifying the subject, we take a step, a mighty step, in advance of the present complicated system of medicine, and one assuredly of the utmost importance. And deeply impressed with this conviction, and correctness of the principles enunciated, I shall now proceed to adduce the facts and reasoning on which they are founded.

CHAPTER I.

OF LIFE—ITS NATURE AND ATTRIBUTES—ITS SOURCE AND
VARIED PHENOMENA; AND OF ITS NORMAL CONDITION,
HEALTH.

1. LIFE.—The Life with which we have to do, I must here observe, is man's physical power of existence,—that which he possesses, and which actuates him, in common with the rest of the animal creation, which, like unto himself, are liable to death, disorder, and disease. We have nothing here to do with that emanation from the Divinity, which was breathed, as it is recorded in the Book of Genesis, into the soul of man by his Creator—that immortal spirit which imparted power to man as God's vicegerent on earth, and gave him dominion over the world and all that dwell therein.

2. THE ATTRIBUTES OF LIFE.—To proceed, the Life upon which we are treating is known by its effects; its attributes are heat and motion. Man is said to be dead when his body is cold, when the motion of his heart ceases, and his breathing is no more. The pitcher is then truly broken at the well; he now ceases to move, to think, and to have a being. The bond between his finite body and the infinity of his immortal spirit is severed: his blood, the pabulum of life, ceases to circulate; the man no longer exists; his body is lifelessly cold, and it is now accordingly consigned to its parent dust: "from dust was man formed, and unto dust shall he return." Heat and motion, then, are doubtless the attributes of life, the bonds of man's existence; and the problem to be solved, therefore, is, how are these produced and maintained in man's system?

3. VEGETABLE LIFE.—Towards the solution of the above problem, let us trace life in the simplest form of its existence and development, as it exhibits itself to us in the vegetable creation. A seed is put into the ground, and in due time it becomes a living plant. To bring about this result, however, or effect its growth, certain conditions are necessary; these are, that a given amount of heat, of moisture, and of air be present. These are all indispensable requirements, as without them the seed will not germinate, or, in other words, those chemical combinations and actions will not take place in the constitution of the seed, whatever its description, by which vitality in it becomes developed,

—a fact we see strikingly exemplified in the grains of corn which have so frequently been found bound up, and preserved from humidity and aërial influence, with the bodies of Egyptian mummies, and which grains, although 2000 years old, when sown, or placed under the circumstances before named, essential to the development of chemical action, have not only vegetated, but also produced their like abundantly.

The grain of seed, when placed under the circumstances mentioned, first imbibes water from the soil; this permeates the grain, and dissolves a portion of the starch which constitutes a large portion of its substance, when the oxygen of the air in admixture with the water, in accordance with the laws of chemical affinity, seizes upon or combines with the carbon as a constituent of the starch, under the quickening influence of a certain temperature or amount of heat, which, as I before said, must be present, when chemical action ensues, and its consequence—vitality, follows. Otherwise, vitality in the seed will not take place, as we find with seed remaining in the ground during the winter season, or when buried too deeply in the ground; but with the required heat, as we see exemplified in the first instance as the spring advances, chemical combination and action ensue in the seed, and vegetation follows. And from the same cause, chemical action becomes developed in the sap of trees—that is, by the warmth of the season; and leaves and fruit are in due time produced. Or, in other words, the chemical combination of the oxygen of the air with the carbon and other of the elements of the seed or sap of the tree takes place; and this is attended with an evolution of caloric or heat, and with the development of electricity (a motive power), the essential stimuli and cause of all vital phenomena, in like manner that heat, and light—the analogue of electricity, if not one of its forms—are evolved or developed by the chemical combination which takes place between the oxygen of the air and the carbon and hydrogen of the tallow or wax of the candle, or gas from its jet, in the ordinary mode of our domestic illumination.

Heat and motion, the attributes of life, being thus developed in the grain, now quicken or excite the germ or embryotic element of the plant, when the structural endowments of the latter enable it to absorb into and assimilate with its own substance the pabulum of the cotyledon or residual portion of the grain—or food in connexion with it. And subsequently, by the roots and plumulæ it has developed, the inorganic substances

contained in the soil and atmosphere which surround it are absorbed ; and thus, the young plant extending its vitality and power, all the progressive changes in its development and growth take place, to its ultimate perfection, and to the eventual reproduction of seed.

4. **CHEMICAL ACTION THE PRIMARY CAUSE OF VITALITY.**—The chemical action pointed out in the seed, by which heat and motion, or vitality is developed in its substance, is no imaginary action, as the process of malting illustrates. Thus barley, after being steeped in water and thrown into a heap, develops heat, and so abundantly, that were it not thinly spread and exposed to the cold air, it would ignite ; and with the heat developed in the grain, the root is thrown out, and active vegetation ensues. And that this is a simple physical effect in nowise dependent upon any vital quality preexistent in the grain apart from chemical action, is clearly manifested to us by what may be observed in the analogous process of fermentation, as of beer for example. The grain or malt when ground is mashed in hot water, by which its starchy and saccharine constituents are dissolved ; the strained fluid being now exposed at a certain temperature to the air, an active intestine motion in the fluid, or in other words fermentation or chemical action, ensues. And that this is attended with an evolution of heat is manifested by the fluid (wort) increasing 20° or more in temperature. It is, moreover, deserving of remark, that the yeast produced in the process, contains, as exhibited by the microscope, an organized vegetable production possessing a vital existence,—leaving no doubt, therefore, that electricity is developed also, as it is known to take place wherever chemical change is effected.

Chemical action therefore, I repeat, is the primary link or cause, by which inorganic substances, earthy and aërial, are converted into organized or living bodies ; and thus it is that of dust are not only vegetable substances formed, but man is also nourished and sustained, and all flesh constituted.

5. **LIFE AS DEVELOPED IN THE EGG BY INCUBATION.**—In the animal creation, the same facts are exhibited to us in the incubation of the egg as we have noticed in the seed. The oxygen of the air contained in the air-cell within it, and permeating also the shell from without, under a given temperature, whether it be imparted by the parent's body, the warm sand of a tropical desert, or the heat of an oven, enters into chemical union with the carbon and other elementary constituents of the albumen or white of the egg, and in so doing forms blood, and

developes caloric and electricity—the animating stimuli which give motion to the blood, which is to be seen by the microscope circulating in vessels twenty-seven hours after the process of incubation (that is, the exposure of the egg to the required temperature) has commenced. And at this early period these stimuli are found also to impart a vibratory motion to the primordium or embryotic mass, which being thus supplied with blood—the *fons et origo vitæ*—and animated, in accordance with its structural endowments and the chemical changes which ensue—brain, muscles, nerves, bones, feathers, all become progressively developed, and a complicated animal, a living bird, is the product; and this, it will be remembered, is constituted or formed from the few elements of the albumen, and in the short period of twenty-one days.

6. DEFINITION OF LIFE.—Life absolutely, I would observe, is the sum of those actions by which heat and electricity are evolved from the blood, and of those also developed by their agency, in the structures ordained (or organs appropriated to the collection of the materials—solid, fluid, and aerial, and their conversion into blood) and associated in the maintenance of those primary organic and chemical actions:—life abstractedly being the sum of their united and concatenated effects.

7. THE ORGANIC LIFE OF ANIMALS.—With the foregoing preliminary observations on life, with its nature and cause, I shall now proceed to explain its source, maintenance, and phenomena in man. Heat and motion, I have attempted to prove, are the attributes or essential characteristics of life. At birth, they are obviously derived from the parent, who imparts to her offspring her warm and animating blood, the source of all power and substance, the pabulum of life and nutrition. But after birth they are maintained by those indispensable requirements of animal existence, air and food, as constituents of the blood. Oxygen gas, one of the constituents of the atmosphere, when inspired into the lungs is admitted into the blood, and, during its circulation therewith, combines or enters into chemical union with the carbon and other elements of the vital stream, which elements, as constituents of the food and dissolved in the beverage we drink, are received into the blood from the stomach and bowels. This combination, so long as man breathes, continuously goes on in every arterial blood-vessel throughout the system, but more particularly in their small capillary terminations, or organic vessels, in which the atomic constituents of the blood are more closely approximated, developing therein or giving out

heat in the process, and thus the body's temperature; and, as these vessels pervade every part of the body—indeed principally constitute the substance of every part—thus the equability of its temperature also; and as electricity, a motive power, the actuating principle of life, is evolved also in the same process, these unitedly operate, throughout the entire organization or structural endowments of the system, as we shall hereafter explain, and give excitement to all the phenomena of life:—heat being essential to the chemical combination and changes which are effected in the blood, as the source of all power; and motion as essential to the blood's circulation, renovation, and all the varied phenomena of life which subsequently ensue*.

8. THE SOURCE OF HEAT AND ELECTRO-NERVOUS POWER OF THE SYSTEM.—The combinations above alluded to as taking place in the blood are known to take place, and to develop caloric, or heat, in the process. They are established to do so by the fact that the air *inspired*, which consists of oxygen and nitrogen, is upon *expiration* found to contain a certain amount of carbonic-acid, a product of combustion, and to have lost its corresponding amount of oxygen; and that as in the combustion of the carbon and hydrogen as constituents of the candle, previously noticed, light is also developed in the process as well as heat, so is electricity—the analogue of light, if not its identity, though presented to us in a different aspect—thus developed also in the animal system. This is a fair deduction, assuming that what takes place out of the body during the combination of oxygen with carbon takes place within it, as we find to be the case, with the development of heat. The experiments of the French philosopher Pouillet, and of Reid in our own country, have furthermore proved that electricity is freely developed in the process of combustion. The fact, too, manifested to us in the development of electricity in the galvanic apparatus by the oxidation of the metal, or combination of the oxygen of the fluid present with the zinc employed for the purpose, is another striking analogical illustration in point.

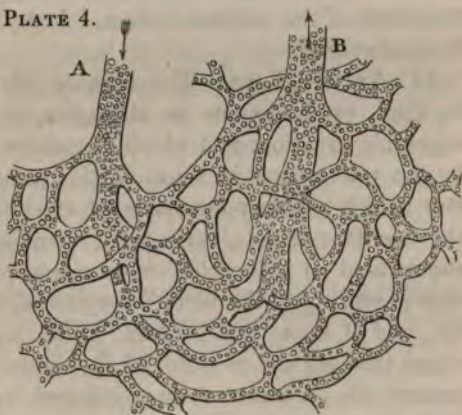
9. ELECTRICAL ANIMALS.—And further, be it observed, that electricity is abundantly developed in the animal system we have the proof afforded us in the electric eel, the torpedo, and other animals; which having no bony limbs to defend themselves, nature in her bounty has ordained a supplementary apparatus,

* See note at the end of this chapter:—"Electricity the motive power or actuating principle of life."

not for its generation, but, abounding in large nerves connected with those of the general system, for the concentration of their electricity, and thus to enable them to impart it by shock as a weapon of defence. On these grounds, I assume it to be a fact that electricity becomes thus developed, as well as heat, in the process before mentioned, and that it is a motive power in the animal system, as well as in the electric telegraph, and in all reality is the actuating principle of life; corroborative of which we have the immediate evidence to adduce in the action it imparts to the organic capillary or structural vessels in the animal system, in which the chemical combinations referred to, and other changes in the composition of the blood developing electricity, more particularly take place. The first action of life visible by the microscope in the incubation of the egg is the blood's motion in these vessels, before a heart is formed; and this motion, I maintain, is caused by the electricity developed in the oxidation of the carbon and the chemical changes which take place in the blood they contain. And the last motion of life to be discerned after death, or rather the apparent death of an animal, when its heart has long ceased to beat, is also, as the microscope demonstrates, the circulatory action and motion of the blood in these vessels, which motion continues as long as the arterial trunks, in connexion with the capillaries, furnish any blood for chemical change and their excitement; and hence the fact that the arteries after death are found empty, capillary action having impelled the blood they contained into the veins.

10. CAPILLARY VESSELS.—These are small hair-like tubes, invisible to the naked eye, but thus seen in the annexed plate through the microscope, connecting the arteries with the veins. In this plate (No. 4) the globules of the blood are displayed, as seen circulating between A, the terminal artery, or vessel of the blood's ingress, and B, the commencing vein, or vessel of egress. To

PLATE 4.



these vessels, the general capillaries of the system, I must now direct attention,—the vessels intermediate between the arteries and the veins—the rudimentary or organic vessels, as constituting the principal substance of all the organs—the vessels of nutrition, accretion, assimilation, and secretion—the vessels which unite the two systems of blood-vessels, the arteries with the veins. The action of these vessels or functions by which nutrition of the system in all its parts is accomplished, and by the motion of which the blood receives its first circulatory impulse, is excited by the electricity evolved from the blood they contain; and hence the fact recorded in the book of Genesis, that “the blood is the life of the flesh,” the blood being, as I before said, the source of heat and motion, the elements of life. And as these vitalizing processes of the blood, as well as nutrition of the system, are carried on, or principally so, by the capillary vessels, they, with the blood they contain, may be truly regarded as the *Alpha* and *Omega*,—the mover and the moved,—the *fons et origo vitæ*. The heart’s action and all the functions of animal life derive their power from this source; all the purposes of the circulation are subordinate and essential to this one all-important purpose,—that is, of bringing the blood purified in its passage through the secretive organs, and enriched with the food and beverage it has derived from the stomach and bowels, and the air it has imbibed from the lungs, to these capillary vessels, that they may fulfil these nutritive and vitalizing processes of organic life,—which accordingly, and in all truth, may be regarded as the first grand cause and parent of all power, by which we move, think, and have our being, as we shall now, in the views we are about to submit of the nervous system, I hope, be enabled satisfactorily to demonstrate.

11. ANIMAL LIFE.—The organic life of animals is the same in kind, or analogous in character, to life as it exists in the vegetable creation, and which circulates the sap as may be seen by the microscope in some of the transparent aquatic species. But to this primary condition of existence, or life as it exists in the capillary vessels, there is, in man and animals in common, superadded an animal life or actuating principle, connected with organs serving to the blood’s formation, circulation, purification, &c., and of sense and volition, which organs are severally influenced through the medium of the brain and nerves. This, the animal life, is, however, superinduced by, and is wholly dependent upon, the organic life I have mentioned; and that capillary

action, or organic life, is the result of the excitation of electricity developed during the changes which take place in the composition of the blood in its passage through the capillaries of the system, or principally so. So, in like manner, the more complex actions or functions of the several organs alluded to, as of the heart in the blood's circulation, the stomach in that of digestion, the liver and kidneys in that of secretion, and all others, are effected by the agency and excitement of electricity also; though possibly, when thus employed, it is in a more concentrated form, or intense condition; than that in which it is first developed in the capillary system; and that the brain and ganglionic system, the accumulating and distributing organs of the electricity, have this power of its concentration. Assuming this to be the case, to these organs I must next direct attention.

12. THE NERVOUS SYSTEM, ITS NATURE AND FUNCTIONS.—The nervous system consists of brain, spinal marrow, and nerves. The nerves are fibrous cords, proceeding from and to the spinal marrow and brain. They connect these organs with the several parts and organs to which the spinal marrow and brain respectively impart influence. The nerves are the conductors of electricity, and, through its instrumentality, of impressions of all kinds in sensation, whether it be in feeling, sight, hearing, tasting, or smelling; and of the mandates of the mind in volition—as in walking, writing, singing, or other exercise of the muscles; thus conducting electricity to and from these organs, like, or indeed precisely similar to the wires or chains of connexion employed in an electrical battery*. To fulfil both these purposes, there are necessarily provided two sets of nerves—one associated with sensation, and the other with volition;—the former being connected with the posterior columns of the spinal marrow and brain, or that part of it in which the especial function of sensation resides, and the other with the anterior columns and brain, or part of it devoted to the function of volition, of which, therefore, as portions of the brain, both these columns may be considered as prolongations. (See Plate 3.)

13. GANGLIONIC NERVES.—To the above are to be added

* Each nerve, the microscope reveals to us, is composed of fibres fulfilling both purposes, bound together as a skein of thread in one common sheath, but insulated from each other by a coating of oily matter contained within a membranous sheath,—exactly like the wires coated with gutta-percha, employed in the electric telegraph extending at the bottom of the sea between the coasts of France and England.

another set of nerves, which, from erroneous views formerly held of their functions, have been called sympathetic, and to which, from their importance, I must now draw particular attention. These nerves, which are now more properly called ganglionic, as they are all connected with small bodies of brain-like substance called ganglions, accompany the arteries in their distribution to all parts of the system, or rather, as conveyancers of power, return with the arteries from their capillary terminations. These nerves collect the electricity as it becomes evolved from the blood in every part of the capillary system, after it has given excitement to these vessels and fulfilled the purposes of organic life; and thence these nerves transmit it to the ganglions and plexuses or meshes of these nerves contained in the abdomen and chest, the great centres of the ganglionic system, the centres of electrical accumulation and supply to the vital organs, or those concerned in the formation, renovation, purification, and circulation of the blood,—that is to say, to the stomach, lungs, liver, kidneys, heart, &c., the primary and essential organs of life; and these organs, accordingly, through the medium of their respective nerves in immediate connexion with these ganglions, are the first, from their importance, to receive electrical excitement as long as any is generated in the capillaries of the system at large, and the last, as I shall presently point out, to be deprived of this fund of excitement, over and above that amount which is developed in the capillaries of their own structure, which must necessarily cooperate in maintaining the excitement of these organs; and hence the fact that the peristaltic motion of the intestines, one of these functions, is found to continue some hours after respiration and the action of the heart have ceased, and the animal, to all outward appearance, is dead. And hence, too the fact, that the heart of the turtle, the shark, and others of the cold-blooded tribe will continue to beat for some length of time after it has been removed from the body of the animal,—chemical action by the agency of the air being, in the blood of these animals, maintained at a temperature often much below that of the surrounding atmosphere, and, in this case of the heart's removal and exposure to the air, developing electricity in the blood of its substance sufficient for its rhythmical excitement.

14. THE BRAIN'S ACTUATING POWER AND FUNCTIONS.—Having pointed out the source of the electricity or nervous power of the system at large, and of its supply to the vital or primary organs of life—to those, that is to say, concerned in the conversion of

food into blood and its aëration—the source of electro-nervous power and of life, and in the blood's elaboration and circulation, I must now direct attention to the source of that power which actuates the brain as the organ of the mind, and that of the secondary functions of life, or those concerned in sensation, thought, volition, motion, &c.—a class of functions subordinate to that of animal existence, though higher in the scale of man's endowments as a sentient and rational being. The amount of electricity, the actuating or motive power, developed in any organ, is necessarily in proportion to the quantity and character of the blood furnished to the part,—the arterial or super-oxygenated blood only being the source of its development. Now the brain is said to be supplied with a much greater proportion of this blood than any other organ of the body, it being supplied by four vessels—the two internal carotids, and the two vertebral arteries. The quantity of electricity developed in the brain we may presume therefore to be considerable; and hence the numerous collecting nerves which accompany the ramifications of the arterial vessels in the substance of the brain, or rather, returning from the capillaries upon them, unite and form, by the number of their fibres and interlacings, the arachnoid membrane (which Mr. Rainey has demonstrated to consist of an expansion or plexus of ganglionic nerves), which enfolds the brain and its lengthened prolongation the spinal marrow. The electricity thus developed in the brain and spinal marrow, and accumulated in the arachnoid plexus, becomes then an available fund for the excitement of these organs in all their functions; and this fund, it must be further observed, is connected with that furnished for the supply of the vital organs within the abdomen and chest, by means of those branches of the sympathetic nerves of the chest which accompany the carotid arteries to the brain. The fund of electrical supply to all the organs (the brain not excepted) is therefore a general or united fund; and hence the sympathy and association that subsists between all the organs, and between the mind and the body, or between the brain in its functions with those of the vital and other organs.

15. **EXCITO-MOTORY FUNCTIONS OF THE SPINAL MARROW.**—The spinal marrow, like the brain, it may be next observed, consists of two entire halves, each half perfect in itself, consisting not only of the two columns previously noticed as prolongations of the brain connected with sensation and volition, but of two other columns also, in which, Dr. Marshall Hall has pointed

out to us, its more special functions reside,—that is, of the respiratory and excito-motory or reflex functions of animal life, a class of functions which are performed in ordinary without the consciousness of the individual. And as these functions are not only accessory, but indispensably necessary to the well-being of those of the vital organs, we may presume, seeing the sphincters are kept closed, and respiration continues during the period of sleep as well as when we are awake, that these tracks or columns of the spinal marrow, which are connected by nerves with the organs concerned in the maintenance of these and other excito-motory functions, are kept at all times in tact, or in operative influence, by a more immediate or involuntary connection with the arachnoid plexus and fund of electrical excitement, than obtains with the other columns of the spinal marrow associated with the brain's function in thought, sensation, volition, &c., and which alone are in abeyance during the period of sleep.

16. EXPENDITURE OF ELECTRO-NERVOUS POWER.—The vital organs in all their functions being furnished, as above described, with electricity, and maintained at all times in excitement, the quantity of electricity surplus to these indispensable requirements of animal existence is imparted by the arachnoid plexus and fund of supply to the brain, when the individual is *awake*, in fulfilment of its functions. The brain becoming thus excited to the various operations of the mind, and the organs of sense associated with it, through the channel of their nerves, to their respective functions, and as these functions (those of the organs of sense in sensation) are all connected and associated with those of the brain in its more especial endowment as the organ of thought, &c., we thus see and hear, smell, taste, feel, and think simultaneously, at all times while awake or alive to all the impressions of sense, in opposition to the condition of sleep, when these functions are suspended. The electricity necessary for the excitement of these functions is obviously under the direction of a limited volition, seeing that we are often enabled to go to sleep at pleasure, and are thus capable of withdrawing excitement from these organs; whereas, when we are awake, it is imparted by the arachnoid plexus and fund of electrical supply to the brain for their excitement—and for the purpose moreover (at the instigation of volition) of the brain's transmitting it by the agency of the spinal marrow in connexion with it, and the second class of nerves, the motor, to the numerous muscles of the body for their excitement. And thus I may will, by an act of my mind

as a function of the brain, to move my arm, for example, and am enabled so to do by transmitting in that act of volition the electrical power along the nerves connecting the brain with the muscles of the arm, which muscles becoming thus excited, the arm is moved by their contraction. And thus, too, is spasm, or preternatural excitement of the muscles, induced in opposition to the will by irritation of the brain or spinal-marrow at the origin of the nerves of the excited muscles; or, in other cases, palsy, or loss of volition or power over the muscles, is induced by the undue pressure of blood seated in these parts, as in apoplexy, or loss of sensation if the pressure be seated in other parts of the same organs.

17. CONNEXION OF THE TWO SYSTEMS OF NERVES, AND CONDITION OF THE BRAIN DURING SLEEP.—I have yet to point out the fact, that to each nerve connected with the spinal marrow a twig or branch of the ganglionic system of nerves is united. This I look upon as an important union of the two systems of nerves, and the channel by which electrical power from the arachnoid plexus and ganglionic system, or fund of electrical supply in its entirety, is communicated to the brain for the fulfilment of all its functions. The brain, when we are awake and alive to all the impressions of sense, thus receives its excitement by the channel of the spinal columns of sensation, or those with which the nerves of sensation are connected, and through the interposition of a ganglion, or rather knot, I am disposed to consider it, especially formed by the blending of fibres of the two systems of nerves. The ganglion which here exists, when we are awake and alive to all the impressions of sense, allows the electrical current to traverse the nerves of sensation and tracks of the spinal column above mentioned, and thus its influence is imparted to the brain, and sensation kept in active operation; whereas, when asleep, it transmits the electrical current in the contrary direction,—that is, along the same nerve to its peripheral termination on the skin, which now gives excitement to the perspiratory glands, and occasions the increased cutaneous transpiration which so generally takes place during sleep. The skin being thus rendered moist or more transpirable, becomes from this cause a more perfect conductor of electricity, to the relief of the system from any excess of excitement which would otherwise attend the existence of a quantity of electricity exceeding that alone necessary to maintain the integrity of the vital functions, under the circumstances of the passive or vegetative condition in which the system

is placed in a state of sleep. The nutritive and secretive processes, there is reason to believe, by the connexion that appears to exist between the sleeping and growth of infants, and the tendency to sleep of corpulent persons, are at the same time, and by the same agency, brought into more active operation. Indeed it is a question in my mind whether the really nutritive and formative functions go on under any other condition than that of sleep, the excitement to or power of which is thus derived.

18. ORDER OF DISTRIBUTION OF ELECTRO-NERVOUS POWER, AND PROGRESSION OF DEATH.—In the grouping of the various functions of the numerous organs of the body, and distribution of the nerves, I have pointed out, it will be obvious, that the vital and mental organs, although distinct in their character, are united with respect to the source and fund of their actuating or electrical power. And it will be further obvious, from what has already been said, and from what follows, that so long as any electricity is generated in the capillary system, the heart and vital organs being in their functions primary in the scale of animal existence to those of the spinal marrow and brain in sensation, volition, thought, &c., they will be the first to receive an electrical supply, and the last to be deprived of it. The next in order of supply, as subservient to the more immediately vital functions, will be those of respiration, and other of the excito-motory or especial functions of the spinal marrow; and the last to be supplied will be the brain, in fulfilment of its functions of sensation, thought, &c. Hence the regulated inhalation of chloroform, that is to say, of chloroform with a sufficient admixture of atmospheric air (the chloroform, I presume, having, from its highly inflammable nature, a greater affinity for oxygen than the hydro-carbonaceous elements of the blood have); this, then, on being received into the blood from the lungs now on its return to the heart, seizes upon and combines with the oxygen, thus deoxidizing the blood in the lungs, and depriving the general current of its chemico-vitalizing properties. Its effects are accordingly to lower the tone of the heart, to which it is now applied, and next, that of the brain, to which, in common with the rest of the organs, it is then circulated. The immediate deprivation of power thus induced, from defect of electro-nervous excitement, produces results precisely analogous in character to that occasioned by sudden loss of blood—the loss of sensation and volition, the first in the series of functions to be deprived of power in man's progress towards death, which would

follow by asphyxia, were the inhalation of the chloroform more perfect.

Hence, also, an animal will live a considerable time after the brain has been removed, provided respiration (which requires a large amount of actuating power for maintaining the muscular motions of the chest), by which air is inhaled, the source of the blood's vital qualifications, is artificially maintained. And after respiration, a function derived from the spinal marrow, has ceased (the electrical supply not being equal to maintain the respiratory movement), and the apparent or outward death of the animal, vitality in the vital organs is still found to exist,—the peristaltic motion of the intestines, a function of one of them, continuing for a considerable time, and capillary action, the rudimentary function or organic life, continuing for some hours after the former has ceased—that is to say, for so long a time as any blood is furnished by the arterial trunks for chemical change and the maintenance of capillary excitement.

19. RESUSCITATION FROM DROWNING, &c.—And thus it is, also, that by re-aërating or oxygenating the blood by inflating the lungs, and imparting heat at the same time if the temperature of the body is much reduced (as it generally is in drowning), vitality or animal life is so frequently restored to the apparently dead,—capillary or organic life still existing in such cases, to an extent capable, under the excitement imparted, of resuscitating the dormant heart, and, by the circulation of the blood, of bringing about the greater result of general life.

20. DEMANDS UPON AND EXPENDITURE OF THE FUND OF ELECTRO-NERVOUS POWER.—The accumulated income of electro-nervous power of the arachnoid plexus, and of the nervous meshes and ganglions of the sympathetic system, which, as I before said, is a common fund, is not to be supposed at any time in excess of the immediate requirements of the system, seeing the demands upon the fund are so constant and manifold. These demands are for the excitement of the respiratory muscles, the heart's action, with the digestive and those numerous secretive functions which are at all times in operation, even during sleep; and further, when we are awake, for exciting the organs of sense with the brain to thought and the exercise of its faculties, and for actuating also the powers of volition in muscular contraction. It is reasonable, therefore, to suppose that the expenditure of electricity in general is equal to the supply, or nearly so—its abundance exciting the brain to its expenditure; hence, in the words

of the poet, "He whistled as he went, for want of thought." And hence it is also that young animals, with an abundant exchequer of this actuating principle—an ample supply of electro-nervous power—are always so sprightly and frolicsome; and most of us, from this cause, at times feel, if I may so express it, the pride of health. That its expenditure in general equals its supply, is pretty obvious from the fact that the arrest of the blood's oxidation in respiration, by hanging, drowning, or other mode of cutting off the supply of air from the blood, and the consequent cessation of the production of electricity in the system, is so immediately destructive to life. The expenditure in some cases, however, may not be proportionate to the supply, and hence the common feeling of fidgets which attends a dry skin; or the brain, or some portion of it, may, by disease, become too attractive of electricity, and thus prove a cause of insanity,—the mental organ, or especial faculty of the brain, or part implicated by excess of its employment, as in monomania, being thus kept in a state of constant or undue excitement; and the delirium attending fever may also be thus occasioned. At all events a quantity at any time in excess of the immediate wants or expending capabilities of the system, would occasion, by excess of excitement, it is reasonable to suppose, some extravagance of conduct, and otherwise make good the axiom that when a man is not well employed, he is sure to be in mischief; for it is clear that mental or bodily action must be in constant operation as long as life exists, either for good or for evil. And hence the follies of the gambler, the sensualist, and those who are not better employed. Hence, too, the wretchedness of ennui, or excitement of the mind without object, experienced by those who are without occupation; and hypochondriacism, which is an effect of the same nature, but associated with hepatic or other bodily derangement. Or the opposite condition of the brain takes place when the stomach is kept in a constant state of excitement by excess of its occupation and tit-bits, when the mental organ is not duly excited, making good the passage in Shakespeare, that "Fat paunches have lean pates: while dainty bits make rich the ribs, they banter out the wits." And in like manner it is probable that idiotism may be dependent in some cases, not on paucity of brain, but upon defect in the communication of electrical excitement to the intellectual portion of it.

21. OF THE MIND AND SENSES.—The brain, in a restricted sense of the word, we must concur with Gall and Spurzheim, in

considering as the organ of the mind; but I am not prepared to say anything of their division of it into parts as numerous as there are faculties, although it is by no means improbable. But speaking of the brain in the aggregate, that is of the whole substance within the cranium, we must assign to different portions the fulfilment of different purposes. The upper hemispherical portions of the cerebrum, or lobes of the brain which surmount its base and the medulla oblongata, consist of numerous convolutions of the brain's substance, united to the central fibrous medullary structure in a manner analogous to the intestines on the periphery of the mesentery, and is the organ, speaking of it as a whole, the functions of which are intellectual. The medulla oblongata, and parts united in forming the inferior portion or base of the brain, from which all the nerves of sense arise, is the organ, or assemblage of organs, appropriated to receive the impressions of the senses, which it communicates to the mind by the blending of its nervous fibres with those of the cerebral hemispheres in the medullary portion of the latter. It is very clear that the senses are all united in function (in short, they are, in reality, all of the same character, the organs being modified in form only, that they may be amenable to the varied forms of matter with which they are severally to be brought into contact or to be impressed), as they are only thus conjointly under the power of volition. As a proof, I cannot will to see without both hearing and smelling; nor have I the power to arrest the functions of either singly, but the whole may be stopped simultaneously by my going to sleep; and hence it is that the motor or muscular nerves of the organs of sense arise also from the medulla oblongata, as they are essentially united in the fulfilment of the respective functions of these organs. And hence also is it that the medulla oblongata is formed by the *crura cerebri et cerebelli*, or that they, at least, enter very largely into its composition, thereby blending the animal or voluntary functions centred in the cerebellum with the cerebral or mental in this organ, as it participates in, and is conducive to, the functions of both, which are conjointly in operation in the fulfilment of the several functions assigned to it.

Finally, the spinal marrow, in its anterior columns or motor tracks, and the cerebellum, to which it is appended, and by which it is surmounted, are unitedly organs more especially appropriated to volition, procreation, and the numerous functions more particularly characterizing animal existence.

22. THE THREE CONDITIONS OF LIFE.—In conclusion, it may

be observed that the scale of animal life comprises three conditions of existence:—first, the organic life, or that going on in the capillary system of animals, which is allied in character with that going on in vegetable bodies, and is in both equally dependent on chemical action, rendering chemical action the bond of union between organic and inanimate nature. Secondly, the nervous and sentient life, or the more peculiarly animal, dependent on the first or organic life, and connected with organs for the blood's constitution and circulation, and of sense and volition. The third and last condition is that one of superaddition, the mental, which transcends the rest, on the summit of which, man, as a rational being, stands proudly preeminent, with a brain or cerebral organ of greatly increased magnitude, and endowed in a ratio with his vast comprehension and superiority of intellect above the rest of the animal creation, and holding communion with an immortal spirit, though in a way inconceivable, by the limited number and capacity of the faculties with which it has been the pleasure of the Almighty to endow him.

23. HEALTH AND SPIRITS—THEIR SOURCE AND DEPENDENCE UPON THE QUALITY AND CONDITION OF THE BLOOD.—I have now, in conclusion of this part of my subject, but to add that, from the foregoing considerations, it will be obvious that the vigour of life, or active joyous health, must, to a great degree, be dependent upon, or connected with, an ample fund, or abundant exchequer of electro-nervous power; and this must necessarily be proportionate to the energy of the chemical action maintained, or the quantity of electricity, the actuating motive power of life, evolved by the blood, and actuating the capillary system. Hence it is that our feelings of health and spirits are so amenable at all times to atmospheric changes and other causes affecting the quality and temperature of the blood, and influencing these chemical operations in the system for good or for evil—the maintenance of health, or the production of disease, in common with the like manifestations of health or disorder which may be observed to attend atmospheric vicissitudes and other agencies of a kindred character on the vegetable creation.

Having now concluded my observations upon Life and Health, and on the blood, and brain, and nervous system, in relation to them, I shall, in the next chapter, on the Physiology of the Functions, explain the structure and offices of the several organs of the body concerned in the conversion of food and beverage into blood, and in its aëration, circulation, purification, &c.

ELECTRICITY THE MOTIVE POWER OR ACTUATING PRINCIPLE OF LIFE.

Upon this subject I must be permitted to solicit the reader's particular attention, in proof that *electricity* is the motive or actuating principle of life—the nervous power of the animal system. This, I may first observe, was the opinion of Hunter, Sir H. Davy, and Abernethy, and is also that of Sir John Herschell, Mr. Faraday, and many able physiologists of the present day, both English and foreign, although it is derided by some others. Some men with their eyes open cannot see; and there are others, again, who I believe *will* not! Let the facts, however, speak for themselves. That the actions of life are dependent on the breathing process, hanging, drowning, or suffocation however induced, testify to be the case; and that these actions of life, like the light afforded by the candle, are dependent upon the air imbibed by the animal in respiration, and upon oxygen, one of its constituents, in particular, is also established by abundance of experiments. Now, in the case of the candle, both light and heat are manifested; and these are the products of the combination, or, in other words, the chemical union, of the oxygen of the surrounding atmosphere with carbon and hydrogen,—the constituent elements of the tallow or wax forming by their union carbonic acid and water, and evolving both light and heat in the process. These are facts all are willing to acknowledge. The same combination takes place in the animal system between some of the elements of the blood, consisting in like manner of carbon and hydrogen, with oxygen, inspired into it also; and this combination is attended with the same products as are developed by the candle—of carbonic acid and water, and of heat, by which the temperature of the body is maintained; and to this, too, no objection can be made. Well, then, as the experiments of Pouillet and Read, adduced in the annexed note*, establish the fact that this

* The French philosopher, M. Pouillet, caused hydrogen gas to flow out of a glass tube; when the gas was ignited, a coil of platinum wire was employed to conduct the electricity evolved to the condenser. When the coil was large enough to enclose the flame, and to be about four inches from its external surface, positive electricity was indicated, which became more and more intense as the distance diminished, short of its touching the flame. He found that during the combustion of alcohol, wax, oil, fat, &c., the same phenomena were exhibited as in the experiments with burning hydrogen. He further placed a small piece of charcoal in a state of ignition beneath a brass plate in connexion with the condenser, and the same result ensued,—the plate above it, on which the carbonic acid impinged, becoming positively electrified. These results are borne out fully by the experiments of Mr. Read, who insulated a large hollow tin cone, with many yards of small wire coiled up within it, one end of which extended through the apex of the cone, which was open, and was connected with a sensitive electrometer; under the cone was placed a vessel of water, the vapour from which, on rising, was condensed and collected by the cone and wire—when positive electricity was displayed. The same result he obtained also by burning different substances under the cone.

chemical combination of carbon and hydrogen with oxygen in the first case—that of the candle—is further attended with the evolution or development of electricity, it ought likewise, and must therefore take place in the second, or within the animal system!

This, then, I believe to be the source of the electro-nervous power. But I may be asked to prove this hypothesis, which I acknowledge I cannot do in the positive way, the subject not being susceptible of direct experiment; but I will bring forward such an amount of presumptive evidence, and so many facts in support of it, that I shall be sadly disappointed indeed if they do not bring home conviction to every mind, and justify me in assuming it to be a fact beyond question, that electricity and the nervous power are identical! We have, first, the fact that certain animals generate it and are armed with it as a weapon: the electrical eel, the torpedo, and the silurus may be mentioned. From an example of the first, a living eel exhibited a few years since in the Adelaide Gallery, I have upon several occasions received an electric shock; and from the same animal, Professor Faraday both fired gunpowder and decomposed water,—leaving no question that animals have the power to produce electricity. Now, when we consider this fact coupled with another—that its electric apparatus is furnished with nerves, of extraordinary magnitude when compared with those of any other part of its system, and that these nerves are associated in common with the rest of its nerves, being part and parcel of the same, and are connected in common with the rest with the brain as the power-directing organ—and we see a corresponding structure of brain and nerves in all other animals, wanting alone the especial supplementary apparatus which these possess for concentrating and imparting the electricity by shock—I say, when we see these animals differ in no other particular of their organization, and are supported in their existence, like all others, by the agency of the air and the ordinary descriptions of nutriment, we ask ourselves why they should differ in this one particular—of being so armed? The answer is furnished by the fact that, in the case of man and other animals in possession of limbs, the electric power can be so much more conveniently and efficiently employed by the contraction of muscles giving motion to their bony limbs, by which a blow or kick is inflicted, or a bite by the motion of the jaw is effected, that no such supplementary apparatus is required. The power, it will be observed, in both cases is the same, but is differently exercised; the nerves, too, being its conductors in both cases, but in the latter case, of ordinary animals, is exercised through muscular action, in like manner precisely as, it is evident, the muscles of the electric animal are excited for its progression and ordinary motion—that is, by electricity,—the medium of imparting it being nerves, which in both cases proceed from, or are connected with, the brain, and in the electric animal are also associated with those of the electric organ. The source of this power—or electricity, generated in the system of both descriptions of animals—is the same,—the oxygen of the air entering into chemical union with the carbon and other constituents of the food, and united in the blood, and conducted, as evolved in the capillary system—wherein the final changes in the blood's composition take place—to the brain and general depository of the system, by which its mental and other functions are excited; and thence it is transmitted, at the pleasure of the animal's volition, by the nerves of conduction to the muscles by which the animal moves, or inflicts a blow; or, in the case of the electric animal, is

concentrated in the electric organ for the purpose—by which a shock is imparted. The analogy is complete in every particular, and is thus further illustrated: in like manner as the oxygen of the acid and water enters into combination with one of the metals of the galvanic combination in the ordinary apparatus, and develops electricity—which the other metal collects, and the wires in connexion transmit—as in the electric telegraph, or in those of the electrician's battery which convey his mandates,—and is thus employed as a chemical agent to decompose water, fire gunpowder, or impart shocks at his discretion; so do the nerves or fibrous cords of animals fulfil precisely the same purposes as the electrician's wires. In support of these views, I may further add a few of the facts elicited by the experiments of Matteucci, to whom the Royal Society awarded a few years ago the Copley medal. In summing up the results derived from his experiments, he observes—"The electrical current is altogether independent of the brain and nervous system (as a source of this power); and the circumstances which exercise a marked influence upon its intensity are respiration and the sanguineous circulation. Sulphuretted hydrogen has a marked influence in diminishing the intensity of this current; its intensity varies according to the temperature in which the animal [he was experimenting upon a frog] has lived a certain time: it cannot be raised without occasioning an increase of activity in this current. The intensity increases in proportion to the rank the animal occupies in the scale of being [rabbits and pigeons were now experimented upon], while the duration of the current after the death of the animal is in an exactly inverse ratio. Experience has shown me that, in proportion to the elevation of the temperature in the frogs originally, so much the sooner the effect of the want of nutrition was manifest,"—food, I may here add, being as essential as respiration to the development of the electrical current. He subsequently adds, "The chemical actions of nutrition evolve electricity." In conclusion, if it be admitted that electricity is evolved by the chemical actions going on in the animal system—which the evidence adduced and Matteucci's experiments pretty satisfactorily prove—and that electricity is equal to fulfil all the purposes of the nervous power—which numerous experiments establish also to be the case,—and that living muscular fibre is the most sensitive of all electroscopes,—and that there is an electric discharge in all muscles at the moment of their contraction, as Matteucci has shown,—I would ask whether it be at all probable that Nature, with her universal economy of means, would provide any second agency to fulfil the requirements of what this one alone is quite equal to accomplish, which second power, moreover, exists only in imagination—there being not a shadow of evidence to prove its existence. And as the "vital force" of Liebig (using his own words) "unites in its manifestations all the peculiarities of chemical forces, and of the not less [mind this] wonderful cause which we regard as the *ultimate origin* of electrical phenomena," I may, with the facts adduced, venture to call it by its proper name, and at once affirm it to be what it really is—*Electricity*.

In explanation of the phenomena of electricity in the animal system, and of its source and production being derived as above explained, I read a paper to the Westminster Medical Society, in 1830, which paper was published in the pages of the 'Lancet' of the 4th of June of that year.

CHAPTER II.

ON THE PHILOSOPHY OF THE FUNCTIONS, OR OFFICES FULFILLED BY THE STOMACH, BOWELS, HEART, LUNGS, SKIN, LIVER, KIDNEYS AND OTHER ORGANS OF THE BODY ENGAGED IN THE PREPARATION, AËRATION, CIRCULATION AND PURIFICATION OF THE BLOOD—*THE FONDS ET ORIGO VITÆ.*

PROCEEDING with the intention expressed in the last chapter, we shall speak, *first*—of the organs concerned in the reception into the system of those elements of the blood derived from man's food and beverage, and the preparation of these by the digestive and assimilative processes of the stomach and bowels and organs associated with them in their semiconversion into blood.

Secondly—of the organs concerned in the absorption from the stomach and bowels of the digested aliment and nutritive juices constituting the semiformed blood, and in the reception of this into the blood; and of the organs of the blood's circulation, namely, the heart and blood-vessels.

Thirdly—of the organs engaged in the reception and absorption into the system of the aërial elements of the blood, and in the exhalation of its aërial and vaporous impurities, or of the lungs and skin.

Fourthly—of the organs concerned in the purification of the blood, the liver and kidneys in particular; and of the skin and mucous membrane of the bowels, as engaged also in the same process.

Fifthly, and lastly—we shall make a few observations additional to those we have already made, regarding the brain and nervous system as the recipients of electricity and imparters of power to all the organs; and of the brain in its relations to sleep, dreams, &c.

See Plates 1, 2, and 3.

The Structure and Functions of the various Organs of the Body.

24. THE STOMACH.—In accordance with the classification pointed out, I shall begin with the stomach, the function or office of which is to digest or dissolve, and partially to animalize the alimentary material or food received into it, and thus render

it in a fit state for absorption and reception into the blood-vessels, for admixture and circulation with the general current of the blood, of which, when absorbed, it constitutes a part*.

The stomach is a membrano-muscular bag, of the shape of a bagpipe, and of sufficient size to contain, when distended, three pints or more of fluid. It has two openings into it,—one above, communicating by the gullet with the throat and mouth for the admission of food and drink, and the other in connexion with the continuous tube of the intestines, from which the stomach is separated only by a contraction or annular division called the pylorus. The substance of the stomach is made up of three coats or strata, covering each other like the coats of an onion. The first or internal coat is the absorbing and secreting, or mucous membrane, which comes in contact with the food, and is the essential one in the process of digestion. The second is the muscular coat, or coat of contraction and motion, by means of which the capacity of the stomach is diminished or extended (and thus is the mucous coat kept at all times in contact with its containing materials), and by which, as digestion is effected in every successive portion of the alimentary material brought in contact with the secretion of the mucous membrane poured out from its surface, it is moved forward and extruded through the pylorus into the intestines. The third or peritoneal coat, the external one, is a mere covering formed by a duplication or fold of the peritoneum or membrane lining the cavity of the abdomen or belly. It embraces the entire organ, and confines it to its proper situation; and on this coat the blood-vessels and nerves unite, and subdivide before distribution to their respective parts.

25. THE PERITONEUM.—The membrane which lines the whole abdominal cavity is called the peritoneum. It in like manner, as

* It must be here noticed and distinctly understood that the blood-vessels are closed vessels, having no openings into them, but admitting fluids, and fluids only, to enter them by infiltration through the substance of their coats, which, in the smaller vessels, in which absorption principally takes place, are as bibulous as blotting-paper. And it has been found that the absorbing power of the vessels is just in proportion to their emptiness, and, conversely, when distended they allow the more fluid portion of their contents to exude or pass out of them; and thus is the nourishment of the system effected: the effused fluid from the distended vessels irrigating the several tissues and structures through which the vessels pass, each structure imbibes the elements of its composition and rejects the remainder, which, as the vessels become empty or less full, is again absorbed, and restored to the general current.

with the stomach, embraces and gives a coat or covering to the intestines and the whole of the organs contained in the abdominal cavity, for the confinement of each in its proper situation ; and from this membrane is secreted a serous or watery exhalation into the abdomen for lubricating the organs, and facilitating their free motion upon each other.

In the healthy condition there is no fluid, but only a vapoury exhalation. Excess of this, or a watery fluid (the serum of the blood) being poured out into the abdominal cavity, constitutes the condition or disease called Dropsy.

26. THE INTESTINES :—the bowels, as they are called—are a continuous tube in connexion with the stomach, and separated from it only by the contracted portion called the pylorus. In structure they consist, like the stomach, of three coats : a mucous coat for the secretion of a lubricating fluid for the protection of its surface, and facilitating the passage of substances through the intestines, and for the purpose also of absorbing or sucking up their alimentary fluid contents—or more correctly, I should say, on which are distributed the veins and absorbent vessels, which fulfil these purposes ; a muscular coat of contraction and motion ; and a peritoneal or retaining coat. The entire length of the intestines is about twenty-five feet. The first four-fifths, commencing with the stomach, and being less in calibre than the remainder, are called the small intestines. These terminate in a pouch called the cæcum, from which arises the colon or principal large intestine, which terminates in a descending straight portion called the rectum, the latter terminating in the external aperture called the anus or fundament.

27. THE DIGESTIVE AND SUBSIDIARY PROCESSES.—The structure of the stomach and bowels being explained, the function of these organs in digestion, and their subsidiary processes, may be now readily understood. Digestion, I must first observe, is a duplex process, a chemico-vitalizing operation of solution and assimilation. It is thus effected : the food previously masticated, or in other words comminuted by the teeth, and mixed with the saliva or spittle, and the air of the mouth, being now swallowed and conveyed by the gullet into the stomach, is brought into contact with its mucous membrane, and submitted to the operation of the gastric juice—an acidulous, highly electrical or vital product, secreted or separated from the blood circulating in the mucous membrane by the agency of the electrical or nervous power furnished by the brain, and brought to the stomach by

the pneumogastric nerves, which more particularly connect these two organs. The excess of alimentary fluid or beverage, when present, is first removed by absorption or the imbibition of the veins of the mucous membrane; the remaining alimentary substance, by the contraction and movement imparted to it by the muscular coat, is now successively brought into contact with the mucous membrane, and blended with the acid secretion—the gastric juice exuding from its surface; and being by these means partially dissolved and assimilated, is, in this digested state, progressively extruded through the pylorus into the intestine. A few inches down the intestine, the digested matter is rendered more fluid by the admixture of the secretions of the pancreas or sweetbread, and of the liver. The secretion from the former organ is a fluid like saliva, and that of the latter an alkaline, bitter, yellow fluid, the bile. These, in a united stream, here dribble into the intestine through a small opening, the mouth of a duct or tube which communicates with the liver and pancreas. The addition of these secretions not only renders the compound more fluid, but still further alters and vitalizes the product (as I shall presently notice), whereby it becomes fit for absorption and reception into the blood-vessels. Thus rendered, its fluid and more nutritious particles are imbibed by the veins and absorbent vessels distributed over the mucous membrane, as it successively travels along its surface by the agency of the contraction and worm-like motion imparted to the intestines by their muscular coat, till it arrives in the cæcum (or pouch, I believe, intended for the reception of air or the gases of the bowels) communicating with the colon or principal large intestine, the receptacle of the more gross and insoluble parts of the aliment, and in which the latter are retained and become solid by the further absorption of their fluid particles, till the distension arising from fæcal accumulation excites the necessary desire for their expulsion from the bowels, and extrusion from the system.

28. THE GASTRIC JUICE.—As already mentioned, the gastric juice is an acidulous fluid: the acid it contains is the hydrochloric, the source of which is the chloride of sodium or common culinary salt contained at all times in the blood. The blood in the secreting vessels of the mucous membrane being brought under the agency of the electrical current furnished by the brain, and brought to it by the pneumogastric nerves which connect the brain with the stomach, the chloride of soda it contains becomes decomposed: the hydrochloric acid, one of the elements of its

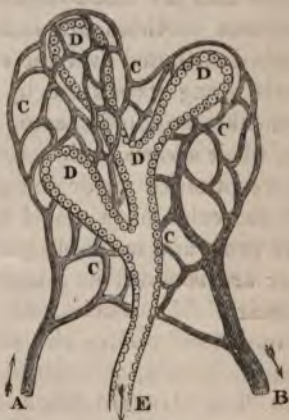
composition, is poured forth with the secreted fluid into the stomach; and the other of its elements, soda, is transferred with the remaining constituents of the blood, by the veins of the stomach, to the liver, where it now becomes separated as the alkaline constituent of bile, secreted by that organ.

We have here presented to us one of the many very beautiful contrivances of the economy of nature. The blood is at all times essentially an alkaline fluid; and from this has to be eliminated an acid solvent of the food or material from which the blood itself is to be formed, but from which, as an acid is incompatible with its existence as blood, it must necessarily be separated or the acid neutralized before it can be received into the circulating current. How admirably are these manifold purposes accomplished!—by the simple decomposition of a neutral and harmless constituent of the blood into its two very active elements, and their recombination when the purposes of their separation have been fulfilled,—the alkaline fluid, bile, flowing into and being mixed with the acidulous digested aliment, immediately it has passed from the stomach into the intestines, thus neutralizing and adapting the compound for absorption and reception into the blood.

PLATE 5.

Ideal section of a gland or secreting structure of any kind; a microscopic display.

A, the artery bringing blood to the capillary vessels C C C, distributed to and covering the follicles D D D, or elementary structure of the gland, which separate, or, as it were, filter, the secretion from the blood, and allow it to escape from the gland by the duct E.



29. THE CHYLE.—The nutritive and partially assimilated alimentary fluid is now called chyle, and when absorbed from the stomach and bowels, and received into the blood-vessels, is, in admixture with the blood, conveyed to the heart and thence to the lungs. In the lungs it is next exposed to the influence of the air inspired from the atmosphere; and thus is completed its conversion into blood.

30. **THE LUNGS OR RESPIRATORY ORGANS.**—The structure and function of these organs are the next objects of our consideration. There are two lungs, one occupying the right side, and the other the left side of the chest; and between the two, but more to the left side, the heart is situated. The lungs consist of air-cells—the terminations of the branches and subdivisions of the windpipe—called bronchi, and of blood-vessels. The latter accompanying the bronchi, and subdividing into innumerable capillary or hair-like terminations, are distributed over the air-cells,—an arrangement by which the blood and the air are mutually brought into contact, the thin coats of these vessels, which are permeable to the air, alone interposing. By the agency of this contact, the blood, which when propelled from the heart to the lungs, and distributed over the air-cells, was of a dark purple or nearly black colour, is now, by contact with the air, rendered of a bright scarlet hue. The blood has now parted with, or exhaled from it, the carbonic acid gas (aëriform charcoal) with which it was charged when brought to the lungs; and has absorbed or imbibed, in exchange for this, a portion of atmospheric air—a gaseous compound of nitrogen and oxygen, the elements of life and heat,—with which it now returns to the heart for circulation to the system at large.

31. **THE PLEURA.**—Like unto the cavity of the abdomen, so is the chest lined with a thin transparent membrane; this, in the chest, is called the pleura. It not only lines the chest, but divides it into two chambers, for the separation of the two lungs; and, further, being reflected over each, it constitutes their coat or external covering. It supplies also the outer covering of the pericardium or heart-bag,—the pericardium itself being formed by a reflexion of the membrane which covers and constitutes the coat of the heart.

These membranes, like the peritoneum, secrete a watery exhalation into their respective cavities, which, when it becomes serous and abundant, constitutes the disease called Dropsy of the chest, or of the pericardium, as the case may be.

32. **THE HEART, AND ITS FUNCTION IN THE BLOOD'S CIRCULATION.**—The heart, situate and surrounded by the lungs in the chest, is a double organ, each half or ventricle of the heart respectively fulfilling the offices of a forcing and a sucking pump,—one half presiding over the circulation in the lungs, and the other over the circulation in the rest of the system, or the body at large. Each ventricle of the heart is a hollow

muscular organ, alternately dilating and contracting, its capacity becoming enlarged in the first instance, and diminished in the last. To each ventricle of the heart, at its summit, is an appendage attached, called the auricle—a pouch for the reception of the blood returning to the heart by the veins, while the ventricle contracts and expels its contents through the arteries in connexion with it—from the right ventricle to the lungs, and from the left through the aorta or main trunk of the arteries, to the body at large. Each auricle, like the ventricle, has the power of alternately dilating and contracting: in the first instance it draws the blood into it from the veins, and in the last expels the blood from it into the ventricle. The auricle is separated from the ventricle by a valvular partition, which opens with the dilatation of the ventricle, and is closed with its contraction—thus preventing the blood regurgitating or returning into the auricle. In like manner have the arteries, opening into the ventricles, valves at their entrance to prevent the blood's regurgitation into them on the dilatation of the ventricle.

With this knowledge of its structure, the heart's function may be clearly understood. The blood, then, being brought to the left side of the heart, by the veins of the lungs from which it now returns, the auricle dilates and draws the blood into it, at one and the same time that the ventricle contracts (and in so doing closes the door or valvular opening between the two chambers), and its contents are expelled with great force through the aorta to all parts of the system. The auricle now in its turn contracts; and at the same moment the ventricle dilates, and in so doing opens the valve, and the blood rushes in from the auricle; and so they proceed alternately to dilate and receive the blood, or contract and expel it. And the same takes place with respect to the other side of the heart, and at the same time, but in the reverse order; that is to say, when one ventricle contracts, the other dilates, and *vice versâ*. And thus, on the dilatation of the right auricle, the blood, returning to the heart by the veins from the system in general, is drawn into it; at the same moment that the ventricle is expelling its contents through the arteries in connexion with the lungs. And thus the blood completes its circuit from the lungs to the left side of the heart and the system in general, and from the latter to the right side of the heart, and to the lungs again. The action or impulse of the heart is attended with considerable force, as may be felt by the hand on the chest, and is synchronous with the pulse felt at the wrist or

elsewhere,—pulsation being caused by each successive wave or jet of blood expelled from the heart by its contraction, and flowing in constant succession through the artery, and numbering, according to the age and constitution of the individual, between 150 pulsations or more in a minute at the time of birth, and from 60 to 80 at mature age.

33. THE HEART'S ACTION—THE ABSORBING POWER.—The heart is also the principal agent of absorption—sucking or imbibing into the vacuity formed by the dilatation or expansion of its cavities not only the blood furnished to it by the veins, which all terminate in the heart, but the air also through the coats of the blood-vessels in the lungs, as well as the air from the skin on the surface of the body, and likewise the fluid nourishment from the stomach and bowels; aided, doubtless, by the superincumbent pressure of the atmosphere upon the surface of the body, as well as by the partial vacuum formed by the expansion of the chest, in which the heart is situated*.

34. THE BLOOD'S RENOVATION AND CIRCULATION.—The blood, being replenished with the fluid nourishment imbibed from the stomach and bowels by the veins, and absorbent vessels (another system of vessels which will be treated of presently), is by the dilatation of the right side of the heart, in which the veins all terminate, drawn into its cavity; from which it is, by its succeeding contraction, as instantly expelled with great force through the vessels in communication with it and the lungs, and distributed over the surface of their air-cells. The blood exhales during its stay in the lungs, the carbonic acid gas it contained (formed by the chemical union, during its previous circulation, of the oxygen of the air with the carbonaceous constituents of the food); and returns to the heart enriched by the air of the atmosphere, with which it has been brought into contact in the lungs,

* The chest is an air-tight cavity, separated from the cavity of the abdomen by a muscular membranous division—the diaphragm or midriff, the descent of which, conjoined with the elevation of the ribs, enlarging the capacity of the chest, the air rushes in by the nostrils and windpipe, and thus distending the lungs, inspiration is effected. And expiration is effected by the reverse action—the ascent of the diaphragm, and descent of the ribs. It will be obvious, therefore, that the enlargement of the capacity of the chest must necessarily occasion a partial vacuum, and consequent dilatation or expansion of the lungs—and in so doing, facilitate the exhalation of the carbonic acid gas from the blood during inspiration; and conversely on expiration—the air in the lungs, by the compression which takes place, must be condensed, and its imbibition by the veins be thereby facilitated.

and which it has, by the dilatation of the left side of the heart, been enabled to imbibe. Thus purified and enriched, and replete with all the elements of life and heat and of nutrition, the blood is now propelled with great force by the contraction of the left side of the heart from the cavity into which it was received from the lungs, through the aorta or main trunk of the arteries, and circulates through its numerous ramifications to all the organs and every part of the system; where, in the organic structure—the capillary vessels or hair-like tubes intermediate between the arteries and veins—the vessels of nutrition, accretion, and secretion—those final chemical changes in the composition of the blood connected with the evolution of caloric and electricity take place, whereby capillary action, or the organic life of the system, is maintained, as before explained.

35. **ANOTHER DISPLAY OF HARMONY AND DESIGN.**—That the blood is the source of the nervous power, and that the brain's office is quite secondary to the rest of the functions, I may in illustration adduce another exemplification of the beautiful and harmonious design of creative wisdom. The aorta, or main trunk of the arteries, proceeding from the heart, at once forms an arch, from the summit of which the carotid and vertebral arteries perpendicularly arise. The blood has therefore, in its passage through these vessels to the brain, to ascend in opposition to its gravity, the rest of the blood, proceeding along the aorta, taking a downward course, and meeting with no resistance. Hence, whenever the heart is enfeebled—that is, its propulsive power diminished—the aorta will not be so fully distended, when the blood circulating through this vessel will take the downward course, and the brain's function, as secondary to the rest in importance, will be the first in the series to be affected by it, and we shall be admonished to remain quiet. This is fully exemplified in the fainting which succeeds to loss of blood, and the giddiness which attends debility. In the first case, place the individual in the recumbent posture, with his head low, and he is immediately restored to animation; and the recumbent posture is equally beneficial in the second case. It offers some light also as to how sleep is induced, and why the recumbent posture should be desired after the fatigues of the day.

36. **THE ABSORBENT VESSELS.**—There are a set of very small tubes, permeating all the structures, called absorbent vessels, and fulfilling the purpose of so many conduits or drains throughout the system—absorbing or imbibing the fluid surrounding them,

extravasated or poured out by the blood-vessels, or other fluid in which they may be immersed. This fluid, by infiltrating itself into their cavities, is by these canals restored or conveyed into the general current of the circulation by the veins, in which the absorbents all terminate.

37. **THE LACTEALS.**—The absorbent vessels distributed over the mucous coat of the intestines absorb from the bowels a portion of the nutritive juice imbuing their surfaces. This juice being of a somewhat milk-like appearance, the name of Lacteals has been given to these vessels. They are numerous distributed over the bowels, and eventually unite in one common trunk, which opens into the jugular vein.

It must be here observed that these vessels, though emphatically called absorbent, appear to be quite subordinate or accessory to the veins, which I consider the principal vessels of absorption throughout the system,—Magendie having most satisfactorily proved, by his very numerous experiments, that the veins are the principal imbibing vessels, and that absorption is carried on by them exactly in the inverse ratio with their fulness and distension with blood, and, further, that when, from repletion, they cease to absorb, exudation of the serous or more fluid part ensues. Hence the necessity and use of these accessory vessels of absorption: without them, dropsy from stagnation of the blood and effusion would be of frequent occurrence, from plethora or other cause of retardation in the venous current.

Again, Magendie having proved that absorption from the bowels is principally effected by the veins, we have in this another very beautiful manifestation of the conservative power, or the adaptation of means to provide for the well-being of the system; for, the veins from the bowels all terminating in a united trunk, which furnishes the blood for circulation through the liver, every instance of engorgement of the liver or obstruction of the circulation through this organ would cut off the supply, not only of nutriment, but of all fluids into the system. Hence the necessity of this accessory system of absorbent vessels, or conduits of fluid into the circulation: without some such provision, as exhalation is at all times going on from the skin and lungs, the blood would become thick and stagnant; and indeed we should, under these circumstances, from the want of fluid, become dried to death!

38. **THE PURIFYING ORGANS.**—The blood, having now completed its circuit, and fulfilled its destined purpose, requires reno-

vation, not only by the accession of new materials for the maintenance of nutrition and combustion, which are furnished by the stomach and lungs, as we have already explained, but by purification also, seeing that it has become deteriorated in quality by the accession of the old and exhausted particles or elements of the system returned by the absorbent vessels into the circulation, as well as by others resulting from combustion and other changes and new combinations which have taken place among the elements of the blood's composition during its circulation, besides those of deteriorating quality or objectionable kind which may have been imbibed with the air and nutriment, and received into the blood from the stomach and lungs. Hence there are provided certain purifying organs, for the separation of all such objectionable and effete particles,—which are accordingly separated from the blood in the form of urine by the kidneys, or of bile by the liver; and the aerial impurities are extricated by the lungs and the skin, in the form of carbonic-acid and other gases, concurrently with the pulmonary exhalation and perspirable secretion. The mucous membrane of the bowels and lungs occasionally, too, excrete matters of the like vitiating description.

39. THE KIDNEYS.—The nature and functions of these organs are accordingly next to be considered. The kidneys are two in number, situated in the loins, at the back of the abdominal cavity, at the root of the liver, and close to the spine. The blood being brought by an artery to the kidney, the urine (or surplus watery and saline particles) is separated from it by the agency of the electric current or nervous power (supplied by the nerves with which the kidney is endowed) during the blood's circulation through the structure of the organ. The urine, as it becomes secreted, infiltrates itself into the central cavity of the kidney, and thence it passes down the urinary duct or tube communicating with the bladder; and as there are two kidneys, there are consequently two ducts, by which the urine is conveyed into the bladder, where it is retained until this organ, irritated by distention, becomes excited to contract upon and expel its contents, or until it is the pleasure of the individual to expel it.

40. THE LIVER.—I shall now, after making a few remarks on the structure and situation of the liver, proceed to explain how bile is secreted, and what are the functions of the liver. The liver is what is technically called a glandular structure, and the largest organ of the body. Surmounting the intestines, it occupies the whole of the right side of the abdominal cavity; from the kidneys behind, it extends in front under the ribs, and across the pit of

the stomach towards the left side. It must be here noticed, before treating of its functions, that the blood supplied to this organ for purification is that which has just before circulated through the vessels of the stomach and bowels, as well as that which has previously circulated through the spleen and pancreas, and is therefore, as venous blood, not only deprived of its more important heat-producing and vitalizing properties, but, moreover, charged with the alimentary juices absorbed by the veins of the stomach and bowels. This last-mentioned circumstance is one deserving especial notice, as marking another beautiful provision of the Almighty, by which unwholesome substances and objectionable particles which may have been imbibed from the stomach and bowels, and would contaminate the vital stream, are eliminated and separated from the blood coming from those organs. The recently-absorbed fluids from these organs are accordingly, for this purpose of purification, first circulated through the liver, before they are admitted into the general current of the blood returning to the heart for aëration, and circulation to the system at large.

41. THE SECRETION OF BILE.—The blood from the stomach, bowels, spleen, and pancreas, brought by their respective veins, and united into one current in the portal vein formed by their junction, is now circulated through the substance of the liver, and is there purified, by the secretion or separation from it, under the agency of the electrical current furnished by its nerves, of a yellow, bitter, alkaline fluid, called bile. The bile, thus separated, is conveyed by an infinitude of small collecting ducts after they have coalesced and are united into one common trunk, into the gall-bladder (a small receptacle for its occasional retention) and the intestines.

The bile flows into the bowels from the liver, a few inches below the pylorus—or gate of entrance into them from the stomach. The soda, its alkaline constituent, now recombines with and neutralizes the acid of the stomach's secretion, which it here meets with in admixture with the alimentary material in its passage from the stomach, to which material, further, as an electrical product, the bile, conjointly with the pancreatic secretion, gives increased vital qualities. And thus assimilated, the nutritive juice it contains is absorbed from the compound during its passage through the small into the large intestines. The effete or objectionable particles of the bile, with the reflux portions of the aliment as they accumulate in the large intes-

tines, into which they are progressively conveyed, are in due time expelled, as previously noticed.

42. THE PANCREAS.—The pancreas or sweetbread, like the salivary glands which pour their secretion into the mouth, secretes a fluid much of the same nature as saliva. This is poured into the intestines with the bile, for the purpose of dissolving and rendering the digested substance proceeding from the stomach more fluid and thereby fit for absorption, and also, as a vital product, assimilating or adding to its vital qualities.

43. THE SPLEEN.—The spleen, it would appear, is of very little importance under ordinary circumstances of the system, inasmuch as it has often been removed from animals without their appearing, after recovery from the operation, to be in any way injured by the loss. The spleen is a spongy distensible organ: its office I believe to be, in character, that of a safety-tube or receptacle, receiving into its substance the blood, when repelled from the surface of the body by the sudden application of cold, or other agency reducing the heart's power. By the contraction of the blood-vessels, and consequent impediment to the circulation on the surface, through the influence of cold, the blood would be suddenly thrown in augmented quantity into the interior organs, which would be liable to produce engorgement of the heart and rupture of its vessels, were the spleen not to provide for its reception. Hence, also, I believe it is, that more permanent enlargement of the spleen so constantly succeeds to repeated attacks of the cold or congestive stage of an ague or intermittent fever.

44. THE SKIN—ITS NUMEROUS AND VERY IMPORTANT FUNCTIONS.—The functions of the skin must now be noticed, as accessory to those of the lungs. The skin is, indeed, as well as the lungs, a respiratory organ, inasmuch as the blood circulating over the surface of the body exhales therefrom carbonic-acid gas, and absorbs, in return for it, an equivalent portion of the atmosphere which surrounds it. The skin is, at the same time, an important secreting surface, excreting from the blood and thus purifying it, by divesting it of certain watery, acidulous, or saline and odorous particles—the perspirable transudation.

The skin and lungs are, moreover, associated in another very important function, that of regulating the temperature and moderating the excitement of the system. These purposes the aqueous exhalations of the skin and lungs, as conductors of heat and electricity, are the means of accomplishing. Hence the *febrile* heat and irritability which exist when the pulmonary or

perspirable secretions are suppressed, a dry skin being an exceedingly bad conductor of electricity, as well as of caloric.

The functions of the skin and lungs, I believe to be quite of a passive character in relation to the chemical changes effected in the blood through their instrumentality, being in this respect merely the organs whereby approximation takes place between the blood and the air. The atmosphere, consisting of four parts of nitrogen and one of oxygen, is absorbed or imbibed into the system with the blood from the lungs by the heart's dilatation, the quantity being proportionate to the heart's power, the capacity of the lungs, and the state of fulness of the blood-vessels. Absorption from without, experiment has proved to take place in the inverse ratio to distention of the vessels; that is to say, the fuller the vessels the less their capacity for and the amount of absorption that takes place. Nitrogen and oxygen are both received into the circulation in the simple state of admixture as they exist in the atmosphere; and both enter into chemical union with the blood during the course of their circulation with it, in quantities proportionate to the affinities existing between them respectively and the other constituents of the blood, under the excitement of and in a ratio with its temperature and electrical condition.

For the further explanation of the purposes enumerated, as well as of the especial functions for which the skin has been endowed as an organ of sense—feeling and touch, I shall briefly add a few important particulars regarding its structure. Its requirements obviously are, high vascularity as a secreting surface, and great nervous sensibility to admonish us of cold and protect us against external injury; and with these it has accordingly been endowed,—the dermis or true skin being so abundantly supplied in these respects, that it may be regarded as composed of blood-vessels and nerves alone: for the protection of which it has accordingly been covered with the cuticle—or scarf-coat, to blunt, in some respects, its sensibility, and preserve it from injury. The universal and equal redness of the skin in blushing, is a proof of its great vascularity; but a still stronger proof consists in our being unable to direct the point of the finest needle into any spot without drawing blood. The same test proves the equal abundance of nervous filaments, for not a point can be punctured without causing pain; and thus is evinced its extreme sensibility—as a guard to us against heat, cold and injury. As a secreting organ, it partakes moreover of a glandular structure, eliminating two pints or more of fluid by invisible transpiration during twenty-

four hours, and a much greater amount when by exercise or heat it sensibly bedews the surface. It is said, indeed, that a robust man, engaged in hard labour and exposed to intense heat, has been known to lose five pounds by weight in the course of an hour.

45. ELECTRICITY THE EXCITANT OF ALL THE FUNCTIONS.—Having briefly explained the functions and structure of the several organs concerned in the formation and purification of the blood, as well as of those concerned in its circulation, I have, before dismissing the subject, only to repeat that, as capillary action or organic life is the result of electrical excitation developed during the changes which take place in the composition of the blood in its passage through the capillaries or principally so, so the more complex actions or functions of the several organs we have been speaking of are effected by the agency and excitement of electricity also; though perhaps, when thus employed, it is in a more concentrated form or intense condition than that in which it is generated or developed in the capillary system, and thence transmitted by the collecting nerves to the ganglions (or centres of this the sympathetic system of nerves) the centres of accumulation and supply to the vital organs, or those concerned in the formation, purification, and circulation of the blood. From these ganglions, situated in the abdomen and chest, is the electricity (in this more intense form or condensed condition), we believe, supplied in accordance with the requirements and necessities of the several organs, through the instrumentality of their respective nerves. And further, as it has been demonstrated that the arachnoid membrane, which envelopes the brain, consists of a plexus or expansion of the same nerves (the sympathetic), which accompany the carotid arteries in their distribution to the brain, and hold immediate connexion with the large ganglions of the neck and the rest of the nerves of the sympathetic system, hence the sympathy, or general consent and association that subsists between all the organs, and the connexion between the body and the mind—the brain being the seat of its manifestations, or organ of the mind; and hence likewise the dependence of the reflex actions and integrity of the functions of the organs of the body upon the state of the mind, and this again upon the former,—considerations which lead me, in conclusion of the subject of the brain and nervous system, on which I have treated so largely in the first chapter, to make the following few additional observations on sleep, dreams, &c.

46. THE BRAIN, ITS CONDITION IN SLEEP, DREAMS, &c.—The

state of being awake, or alive to all the impressions of the senses, I am of opinion, is that in which the current of electricity imparted to the brain from the arachnoid plexus and fund of supply, passes through, or is extended to, the medulla oblongata; and thus are the senses and all the functions of the brain maintained in a state of excitement. Whereas, in sleep, the quantity of electricity surplus to the requirements of the abdominal and thoracic or vital organs, instead of being transmitted through the channel of the filaments of the sympathetic nerve in connexion with the ganglionic system, and the nerves of sensation in connexion with the posterior columns of the spinal marrow and brain (and thus influencing the latter while awake), passes off by the same nerves of sensation to their peripheral terminations, and, thus increasing the perspiratory function, escapes from the system. Or it may be, that, instead of its being extended from the spinal marrow to the brain, the electricity passes off by the pneumogastric and respiratory nerves—as these take their rise from the medulla oblongata at the summit of the spinal marrow below the origin of any of the nerves of sense; hence digestion and the nutritive processes are so much more active during sleep, the electricity escaping ultimately, as in the former case, with the increased perspiration it gives rise to. Dreams, we may infer, are occasioned by the excitement of the intellectual organ, the pneumogastric and respiratory nerves and functions in operation not withdrawing the electricity so fast as it is supplied. From the same cause is it that it is so difficult to sleep with an empty stomach; the electrical power not being engaged in the digestive process, the mind is kept in activity; and in like manner, the converse of this—how great the propensity to sleep after a full meal! Finally, the spinal marrow and the cerebellum, to which it is appended, are unitedly organs more especially appropriated to volition and the numerous functions more particularly characterizing animal existence; to the excitement of which, accompanied by that of the cerebral organ during sleep, but unaccompanied by that of the medulla oblongata and the senses, may somnambulism be attributed.

Finally, I must observe that the brain is a double organ—divisible into two entire halves, each perfect in itself,—one presiding over one half of the body—that of the opposite side,—and the one on this side in like manner over the other. This division has led to the idea, and countenances the opinion, of the duality of the mind, which of late, with some, has been a favourite speculation.

CHAPTER III.

OF THE NATURE AND INFLUENCE OF THE VARIOUS AGENTS IN ORDINARY OPERATION UPON THE SYSTEM, FOR GOOD AND FOR EVIL—THE SUSTENTATION OF LIFE, OR THE PRODUCTION OF DISEASE; NAMELY—AIR, TEMPERATURE, DIET, EXERCISE, SLEEP, MENTAL EMOTIONS, &c.

HAVING explained the nature of life and health, and of the functions and structure of the numerous organs concerned in their maintenance, I shall now proceed to explain the action and influence of the various agents and elements operating upon the system for good and for evil—the maintenance of health or the production of disease. And first, those operating from without the system; next, those received into the system—entering into, and for the most part composing the blood; and lastly, I shall explain the influence of mental emotions and causes of like character operating from within.

47. **THE AIR.**—The first in order will be the air of the atmosphere,—an element which, I may here observe, is of extensive influence, great importance, and of extremely variable character—inasmuch as, independent of its composition and purity, it is subjected to a variety of causes of disturbance in its meteorological condition, which modify its influence upon the system, physically and chemically, for good or for evil—according to the constitution of the individual, his condition of health, or other circumstance which may be in operation at the time.

48. **THE AIR'S COMPOSITION.**—The composition, temperature, and humidity of the air are the three principal conditions deserving attention; but others, as its electrical and barometrical states, will not escape notice. The atmosphere, in its pure state, consists of two gases in a state of simple admixture—oxygen and nitrogen, in the relative proportions of one volume of the former to four of the latter.

49. **IMPURITIES OF THE AIR.**—The air contains also a variable proportion of carbonic-acid gas—the gas evolved by the respiration of animals, and the contaminating product of fermentation, decomposition, and combustion. The quantity of this gas usually

present in the air does not exceed one part in a thousand, in which proportion it is inappreciable in its effects ; but when this amount is much augmented, it becomes highly deleterious to animal life. Hence we occasionally hear of persons being killed by exposure to this gas—the product of burning charcoal,—as well as others being suffocated by descending into cellars where beer or wine has been fermenting, or into wells—into which this gas, being specifically heavier than atmospheric air, has been found to gravitate. The impurity of the air in crowded assemblies is owing principally to the presence of this gas, with which the air of the apartment becomes contaminated by the respiration of the persons assembled in it,—each individual evolving from his lungs twenty-five cubic inches of this gas per minute, and further deteriorating the air by withdrawing from it during the same minute thirty-two cubic inches of oxygen—the preeminently vivifying constituent of the atmosphere. The combustion of the candles, gas, or oil with which the apartment may be illuminated, is another and abundant source of contamination, of like character with that of respiration. Happily, however, heated air is rarefied, and ascends to the ceiling accompanied by that which is heated and rendered impure by respiration, drawing into the room through every hole or crevice, the cooler and purer air in its place. Were it not for this circumstance, from the generally imperfectly ventilated state of our assembly-rooms and apartments, the lights would go out, and, with this, life would be extinguished, from the want of the requisite supply of oxygen, and the presence of this contaminating product of respiration—carbonic acid,—as was exemplified in the analogous case of the party confined in the black-hole of Calcutta ; in which case, from the want of ventilation (the air being admitted into the apartment by two small windows only), out of one hundred and forty-six persons confined in it for ten hours, only twenty-three were found alive at the end of that time.

50. VENTILATION.—Experiment proves that a man makes on an average twenty respirations in a minute ; and at each inspiration he inhales sixteen cubic inches of air, or three hundred and twenty in a minute,—consuming during this period thirty-two inches of the oxygen it contained, and evolving in its place twenty-five inches of carbonic acid. The supply of air, for the ventilation to be perfect in any apartment, should therefore be in accordance with this necessity of our condition, or equivalent to this demand, which Dr. Reid, who has paid great attention to

the subject, estimates at ten cubic feet per minute for each person present.

51. CARBONIC ACID.—Dr. Reid observes that, “carbonic acid being the principal impurity communicated to the air in all ordinary apartments, the amount present may in general be taken as an index of the state of the atmosphere and the efficiency of any ventilating arrangement. Any ordinary atmosphere containing one per cent. of carbonic acid must be regarded as of very inferior quality, and not fit to sustain health, though in numerous apartments a much more vitiated air may be discovered.” He also observes that a general reduction of strength and firmness both of mind and body, accompanied by an inferior appetite, invariably attends long or frequent continuance in an atmosphere so deteriorated.

52. MALARIA ; ITS NATURE.—Another gas with which the atmosphere is liable to become contaminated is the sulphuretted hydrogen—the most deleterious of all the known gases. Experiments upon animals have proved that an atmosphere containing less than a thousandth part of this gas is soon destructive of the life of the animal exposed to its influence ; and a quantity so small as not to exceed one fifteen-thousandth part has been known to produce injurious effects upon the constitution. This gas, which is highly offensive to the smell (as the odour of rotten eggs evinces), and the carbonic acid, as well as some other compounds of carbon, hydrogen, and nitrogen, are the gases evolved by the decomposition or putrefactive fermentation of animal and vegetable substances ; and these gases, eliminated from cesspools, drains, ditches, churchyards, and the like, are the too prolific causes of disease. And as these places are known to be the principal sources of malaria, it is reasonable to infer that these gases are the principal constituents of malaria. And as malaria is known to possess at times distinctive peculiarities in its effects, as respects the disease it occasions, the variable admixture of these gases will explain, not only the general effects of malaria, but the particular effect or variety in the disease it may give rise to, taking also into account the constitution of the individual, the state of the system at the period of exposure, the season, and other influencing circumstances.

The foregoing facts sufficiently explain the pernicious effects of malaria upon the system. And as heat and moisture materially facilitate the decomposition of all organized substances, we accordingly find that low situations and the often-flooded banks

of rivers, ponds, marshes, or wherever vegetable or other organized matter is to be found in a state of decomposition, are also the prolific sources of malaria, and its consequence, fever,—and especially so in hot climates or seasons. Vegetables stowed away in a damp cellar have often been known to cause fever; and sapulent wood received on shipboard; articles of food, or other animal or vegetable substance—as skins, horns, or the like, stowed in the damp hold of a ship; its own unseasoned framework or timbers likewise—have all been known to produce the same pernicious effects. In hot climates, rice-grounds and jungle or forests are very productive sources of this most pernicious, or rather, I may say, when concentrated, truly poisonous agent; the effects of which, in the development of disease, I shall hereafter explain.

53. IMPURE AIR THE PROLIFIC SOURCE OF DISEASE.—From what has been said, it will be seen how prolific must be the sources of malaria and disease supplied by the damp, crowded, unclean, and ill-ventilated cellars and apartments of the destitute poor. Of the rapidity with which the decomposition of animal substances, and their conversion into offensive and impure products, are effected, some idea may be formed, by the offensive smell which, most persons must have noticed, attends a particle of meat when it has been retained for a few hours between the teeth. If we conjoin to the conditions mentioned above, cold and insufficient nourishment, and food often unwholesome also in kind—and these are circumstances under which thousands of the destitute and suffering population of our cities exist—we cannot be surprised that typhus, scarlatina, and a host of fevers prevail,—to say nothing of cholera and the numerous ailments of the stomach and bowels, dyspeptic and otherwise, which this cause (malaria) in a less concentrated degree, or under more favourable circumstances, gives rise to.

54. THE NATURE OF AIR, OR GAS.—Having noticed the constitution of the air, the importance of its purity, and the evils attendant on its contamination, I must next, in order that its operation and influence upon the system may be understood, endeavour to give a clear idea of the nature and constitution of aerial fluids or gases, in general. A gas may be understood as consisting of a solid ponderable substance or base, in combination with caloric or heat. Thus ice, a solid, in combination with a certain amount of heat, is converted into the fluid, water. Augment the quantity of caloric, and it becomes an aerial fluid,

vapour. This, if kept at the temperature of boiling water, would remain permanently gaseous; but as the heat made use of for its production is withdrawn, the caloric of the water's solution is gradually abstracted by the air and surrounding bodies, and the vapour is accordingly condensed; and if the surrounding temperature exceeds 32 degrees of Fahrenheit's thermometrical scale, reverts into its former condition of water; or of ice, if it be below that point—the temperature of congelation,—as we see exemplified at different seasons of the year, in the production and fall of rain, hail, or snow, by the condensation of the vapour of the atmosphere, a certain amount of which is always in suspension by the air at all temperatures.

55. OF COMBUSTION, AND THE DEVELOPMENT OF HEAT.—Oxygen, nitrogen, hydrogen, and other gases—or, in other words, the diffusive solutions in caloric of their respective ponderable elements—are permanently gaseous, but for no other reason which we are aware of, than that we can make no direct reduction of their temperatures, equal to their consolidation,—the earth, the air, and everything around us containing an amount of caloric which precludes the possibility of our doing so, that is to say, in the direct way; but indirectly their disunion or separation may be readily accomplished—by presenting to the gas some body which has a greater affinity for its ponderable base than the latter has for caloric. For instance, melt a piece of lead in contact with the air; the lead at this temperature has such an affinity for the ponderable base of oxygen gas—one of the constituents of the air, that it immediately seizes upon it from the atmosphere, and the compound which is formed, now called an oxide of lead, is progressively converted into the crystalline substance of red lead, and weighs perhaps double the amount of the lead employed. The caloric of the gas is necessarily disengaged and dissipated by the process. If, instead of lead, zinc is melted, the oxide which is formed by its union with the air, being a very light substance, is dissipated in the form of a white powder; and the combination, moreover, that takes place, is so sudden and intense, that it is attended with a vivid combustion. That is to say, the affinities, under these circumstances of temperature, are so strong between the oxygen and the zinc, that the caloric disengaged from the gas is so rapidly evolved, and so concentrated, that it assumes the visible form of light. This well illustrates the ordinary combustion of daily use. Carbon and hydrogen are the substances employed as fuel, as they exist in

combination in oil, lamp-gas, or coal; or the first simply, as charcoal. These, when heated to the required degree by first applying a little fire, immediately enter into rapid combination with the oxygen gas of the atmosphere, producing water (as a compound of oxygen with hydrogen) and carbonic acid, and liberating their combined caloric—in the sensible state of light and heat. Electricity also, either as a constituent of the gas, or as another condition of caloric, is at the same time evolved, as the experiments of M. Pouillet and Mr. Read, before noticed, testify.

56. THE AIR THE SOURCE OF LIFE AND HEAT.—The office of the air in respiration, and the importance of oxygen in the system, will now be readily discerned. Oxygen and nitrogen, the constituents of the atmosphere, both enter the blood, as I have before explained, on inspiration. Carbon and hydrogen, the principal elementary constituents of the food received into the stomach, are contained also in the blood; and with these the oxygen in the blood progressively combines, producing by their union water and carbonic acid gas, and developing—caloric and electricity, or heat and motive power. The other constituent of the atmosphere, nitrogen, enters into combination, though in much less quantity, with these and other elements of the blood during its circulation, producing by its combination, albumen—the principal elementary constituent of animal substance—and developing caloric, and probably electricity also, in the process. I say probably, as we have no experiment at present which proves this to be the case. I shall speak of the nitrogen of the food hereafter.*

And thus the vital activity and temperature of the body are at all times maintained,—that is to say, so long as respiration continues—food of course being also supplied; but arrest this, and life ceases. Hence it is, that drowning, hanging, or suffocation—however induced (that is, the deprivation of oxygen by cutting off the supply of air), is so immediately destructive of life. Respiration, however, as I have previously pointed out, is not confined to the lungs only,—the skin also performing the same function, but not to the extent necessary to maintain the numerous actions essential to the existence of warm-blooded animals, although sufficient to maintain the torpid, hybernating state of some during the winter season—as the snail, frog, snake, tortoise, bat, dormouse, and some others, the phenomena of which I shall now explain, with some other conditions of life of an analogous character.

57. THE HYBERNATING STATE OF ANIMALS.—I must first observe that every animal has its own specific heat, or temperature at which its functions are most efficiently or healthily performed. That of man and most of the Mammalia class is 98° Fahrenheit. In birds it is as high as 108° or more; in frogs and other reptiles, as low as 45° . Well then, whenever the atmospheric temperature, by the withdrawal of the sun's influence in the autumn, is reduced below that degree which is compatible with the perfect action of the cutaneous and pulmonary capillaries of the hybernating animal, its functions, of respiration in the exhalation of carbonic acid gas and absorption of oxygen, are but imperfectly performed; and in consequence, the chemical changes in its blood connected with the evolution of caloric and electricity are so much diminished, that the quantity of these generated is not equal to the excitement of the brain, and to the maintenance of the action of the respiratory muscles; hence the cessation of their functions, and the profound sleep which ensues. But as the temperature of these animals (say, the dormouse), by their timely withdrawing into holes and comparatively warm situations, is not reduced below that degree which is compatible with a certain though limited amount of respiratory action being carried on by the cutaneous surface, organic or vegetative life is still continued. Hence Spallanzani found that torpid animals, whose respiration as far as the lungs were concerned had ceased, carbonated the air in which they were confined*. In this state of

* This will very well explain how it is that frogs have been found imbedded in trees, and in solid blocks of stone, for periods necessarily of incredible duration, and have been resuscitated on exposure to the air. It will be remembered that they have been thus incarcerated in their torpid state, the tree growing around them having gradually, but perfectly, excluded them from the air's influence (not only the vitalizing, but the great destroying agent), leaving them, at the same time, immersed in an atmosphere of their own generation—carbonic acid, which is known to possess a high preserving power upon all animal as well as vegetable substances. And as frogs may be frozen, and subsequently restored to life by gradually thawing them (that is, restoring their blood to its fluidity and temperature), it requires no stretch of imagination to suppose that they may be thus resuscitated by the vitalizing principle of the air and warmth, when removed from incarceration and their non-deteriorating localization—in short, from circumstances precisely the same in character with those of the grains of corn which have sometimes been found encased with the Egyptian mummy, and which have vegetated when they have been subsequently exposed to the essential influences of the grain's vital development—air and moisture. In the case of the stone, the frog would become suddenly

vegetative existence, or torpidity, they remain throughout the winter, consuming the fat which they have abundantly accumulated during the summer, and with which clothed, as it were with a garment, they are protected from the cold, till the genial warmth of spring increases chemical action, and augments the motive power; and with it the respiratory office of the lungs and the function of the brain are restored, when the animal, thus resuscitated, proceeds forth in quest of food. The same fact is, analogically, well illustrated in the vegetable kingdom: the warmth of spring expanding the sap, and increasing evaporation from the barky surface, atmospheric absorption is thus facilitated, and the chemical processes of vegetable life, and, with these, secretion and the budding and development of the leaf or lungs take place; and ultimately, as a consequence, the more complex actions of impregnation and fruition ensue, differing but little from animal reproduction. And conversely, thus it is with the *fœtus in utero*, like the hybernating animal: defectively oxygenated blood (for so it must be, circulating in the *fœtus*, which is excluded from aërial influence, and renews but a portion of its blood by an interchange with the mother) is productive only of that quantity of electricity necessary to its formative development and vegetative existence—or state compatible with the non-performance of the respiratory action and the numerous functions of animal life. Hence it is, that when the development and growth of the *fœtus* are complete, and by consequence the quantity of electricity generated exceeds the necessities of its condition, excitement is communicated to its containing organ the uterus, and its expulsion is effected; when respiratory action immediately follows, and with it animal existence. The *fœtal* state is strictly analogous to the condition of the hybernating animal, and allied also to that of sleep after birth.

58. CLIMATE AND SEASON.—Reverting to our subject after so long a digression, the temperature of the air will be the next object of our attention, which will necessarily embrace some observations upon climate and season. I must first observe that, as every species of animal has its own particular temperature, we may fairly infer that this its specific heat is essential to the accomplishment and perfection of the chemical changes going on in its system, and to

incarcerated by a flood of sand; in the tree, the total exclusion of the air would be progressive, in which case it is possible the frog may have been supported during the period by the sap of the tree, or insects which may have secluded themselves in the same abode.

the well-being of the individual, as we see exemplified in the varieties of the vegetable creation, each genus being confined to some specific zone of temperature, where alone it will thrive. Hence, as man's temperature, in common with that of many other animals, is 98° , how simple and beautiful the Almighty's law, whereby this degree of heat is equably maintained in the system, or nearly so, at all seasons of the year, and under every variety of temperature and climate! This equability of animal temperature is regulated simply by the density or rarity of the atmosphere, attending the change in its thermometrical condition. Cold, condensing the air, renders it proportionably richer in oxygen; and the air, thus respired, augments chemical action and the development of heat, and with it electricity and vitality in the system, where, in a cold climate or season, from the increased abstraction of heat, or radiation from the surface of the body, and the exertions necessary to man's maintenance and more abundant wants, they are more largely required. And the reverse of this in a hot climate,—heat rarefying and attenuating the atmosphere, and thus proportionably diluting it, diminishing chemical action and combustion in the system, where, to maintain the proper temperature of the animal, the surrounding atmosphere being warm, it requires that less heat should be developed, as well as less electricity or motive power—as less food or fuel is necessary to be procured. Or, in other words it may be thus expressed:—to maintain the same temperature of the blood at all times and at all seasons, and under every variety of latitude and of climate, it must be obvious that the production of heat in the system must be in proportion to its radiation: and consequently, when the body is surrounded by a warm atmosphere, the combustion or development of heat in the system must be proportionately diminished; or the reverse of this must take place—in the way I have already explained. For, as a late writer justly observes, “as all bodies only give off heat in proportion to their excess of temperature as compared to surrounding bodies,—the human body being constantly at the temperature of 98° , nearly twice as much heat would be given off (if the body were freely exposed) when the surrounding air is at 50° , as would be the case if the latter were raised to 70° .” Hence too it is, that as we expend more of the fuel of the system (carbon and hydrogen) in cold weather, our appetite is increased in proportion, to supply this necessity of the system.

59. EFFECTS OF HEAT.—It will be observed that proportionately

with the development of heat, so is the vitality or electrical excitement of the system. Hence, from the diminished evolution of heat, and defective excitement of the system that ensues, the debility so generally experienced in hot weather; and from the same cause, conjoined with the excess of carbon—as this is eliminated from the system in less proportion, and with which therefore the blood often becomes surcharged—the derangements of the bowels and liver which so frequently take place in the summer season, as will be hereafter explained; or, in hot climates, the diseases of those organs, to which the European entering the tropics is so peculiarly liable; and further, as we see exemplified in India, from the continued operation of heat, and the diminished vital development, the less intensity of thought, the less bodily vigour, and the apathy of character of the natives, compared with the inhabitants of more temperate climates*.

60. EFFECTS OF COLD.—Cold, on the contrary, I repeat, condenses the air, and accordingly affords a more abundant supply of oxygen to the system; and thus cold weather, within a given range, adds vigour and spirit to the system. But, on the contrary, when the temperature of the air is reduced below the point compatible with the function of the capillary vessels of the skin and lungs, exposed to its influence, being effectively carried on—or, in other words, whenever the system is robbed of its heat faster than it is generated,—the chemical actions going on in the system are proportionately diminished or arrested, and torpor or debility of function of the organs, one and all—or disorder, ensues; or, in the extreme degree, death. Hence it is, that many aged or infirm persons and young children die in cold and inclement seasons, even in the temperate climate of Great Britain.

61. MOST CONGENIAL TEMPERATURE.—The temperature of the air in England fluctuates during the year between 20° and 80° of Fahrenheit's thermometer. The mean of the year is about 50° ; between which and 70° , according to the age and constitution of the individual, the temperature is most agreeable to the feelings

* The experiments of Goodwyn, and more recently of Edwards, prove that, when an animal is placed in a cold medium, the quantity of air it carbonates in a given time is greater than when placed in a warm medium. Whence it follows, that in the regions between the tropics, which have a medium temperature of 80° , the difference must be very considerable, seeing the quantity at 50° was double that produced at the temperature of 100° in Goodwyn's experiments.

of all, and is, accordingly, the most healthy. Nature, with her usual providence, thus speaks to all and each of us, endowing us with these sensibilities for our protection and guidance. Our clothing, therefore, and the temperature of our habitations, should be at all times in accordance with her admonitions, a comfortable feeling of warmth being the point to be aimed at by each of us.

62. HUMIDITY OF THE ATMOSPHERE, AND ITS OPPOSITE CONDITION.—The humidity or hygrometrical state of the air is another condition which materially affects its influence on the system for good or for evil, and has much to do with our feelings as regards its temperature. A certain amount of moisture is at all times present in the air, and in a limited degree is essential to the well-being of the pulmonary and cutaneous surfaces exposed to its influence. A deficiency in the amount, or excess of dryness in the air, robs them of their humidity, and occasions dryness and constriction of the skin, throat, respiratory tubes, and nostrils; and thus, in some instances, cough, sore throat, &c., are induced: and affections of the kind too commonly attributed to exposure to cold are much more frequently brought on by sitting in over-heated rooms during the winter season. And now, while on this subject, I must add that all the like affections attributed to cold are brought on, not by the exposure to cold, but by the reaction, induced by heat, that follows. The individual thus exposed, on returning to the house, instead of keeping from the fire and gradually gaining warmth, rushes to it, or into an apartment heated probably to 20° or more above the temperature of the external atmosphere; and thus is reaction with irritation brought on in the parts exposed, and disease induced, in like manner as chilblains (as every one knows) are occasioned by bringing the cold toes or fingers near to the fire: these are affections similar in kind, but located in different structures.

Surrounded, however, as England is by the ocean, the atmosphere of our island seldom becomes too dry; but, on the contrary, from the prevalence of westerly winds, which sweep in their course over the Atlantic Ocean, dampness or excess of moisture is a frequent condition. This damp state, if conjoined with heat—or “mugginess,” as it is called—we find depressive of the energies of the system. This is strikingly exemplified in the horse, which, as the reader may have observed, or as every stage-coachman can tell him, in this state of the weather soon sweats, and is incapable of performing half of its ordinary duty. And

why so? For these several reasons:—The air, when saturated with moisture, is too perfect a conductor of electricity, and accordingly robs the system too fast and too abundantly of its produce. This is exemplified by the ordinary electrical machine: in damp weather the electricity produced by the machine cannot be concentrated or retained by the conductor, or the glass vessels used for the purpose. And again, as this state of the air is always accompanied by a low barometer, there is not the usual support or incumbent sustaining pressure of the air on the surface of the body; and in consequence, the blood is not returned so freely as it should be to the heart; nor is so much air imbibed—the pressure upon the surface, or the power which impels both the air into the system, and the blood into the vacuum formed by the heart's dilatation, being proportionately reduced. And lastly, though not least in importance, is the fact that in proportion to the humidity of the air is it less rich in oxygen and vitalizing power; and again, in the same ratio is evaporation from the superficies of the body diminished—and thus are fluid and gaseous matters retained in the system, which as excretions (perspiration and the like) should be expelled, or the blood otherwise becomes vitiated by their retention, and disease follows as a consequence: and this, be it observed, is a much more frequent cause of disease than is generally considered.

63. RAW STATE OF THE ATMOSPHERE.—Humidity of the atmosphere conjoined with cold—or “rawness,” as it is usually called—is a condition equally objectionable, inasmuch as it robs the system, not only of its electricity, but of its heat also. Hence it is in the highest degree liable to torpify or arrest the cuticular and perspiratory, or pulmonary and respiratory functions,—to the capillary vessels of which surfaces it is immediately applied,—giving rise to congestion, irritation, or inflammation of these organs, as well as of more deep-seated parts which may be also thus influenced, and characterized by the symptoms of cough, cold, sore-throat, rheumatism, and fever; as well as occasioning many other disorders of an inflammatory kind, which will be noticed hereafter.

64. ATMOSPHERIC PRESSURE.—To what has already been said on the density of the atmosphere, may be added, that the mean pressure of the air upon the body, as shown by the quicksilver in the barometer standing at 30 inches, is fifteen pounds upon every square inch of surface. It operates within, upon the lungs, as well as without, upon the body's surface. This sustaining power,

the pressure of the atmosphere, is estimated to amount to not less than 30,000 pounds weight upon the whole superficies of the body.

65. EFFECTS ARISING FROM A LOW STATE OF THE BAROMETER.—Dr. Reid justly observes, “Every variation from the ordinary range of density to which the body is subjected must necessarily induce peculiarities of tension throughout the system, and affect more especially the cells of the lungs, the pores of the skin, and the cavity of the cranium. It cannot be questioned, that some of the sensations which are familiar to every constitution, but more particularly to invalid and nervous persons, and which are dependent on a change of weather, are more peculiarly associated with a rise or fall in the barometer. In asthmatic cases this may be particularly noticed. The tendency to exhalation from the surface, and the amount of expansion in all the more compressible tissues, must unquestionably increase with the fall of the barometer. The amount of air supplied to the blood in the lungs must obviously vary at each inspiration, according to the density of the air inspired.” Dr. Reid further observes—“But the influence of a variation in the height of the barometer, is perhaps more familiarly known by its effects upon stagnant pools, and marshes, and all materials loaded with gaseous products, whether formed by putrefaction or other process. The effluvia from drains and marshes, and the fire-damp of mines, may be taken as well-known examples of matters subject to such changes. If these be in a great measure pent up by the pressure of the atmosphere, in those bodies from which they are discharged, the amount evolved in such cases being comparatively trifling, a sudden fall of the barometer immediately causes their liberation in abundance, which is much more excessive at first than afterwards—as the amount dissipates. The influence of the pressure of the atmosphere is accordingly most important in low, confined, and marshy situations, subject as they are to unwholesome exhalations.”

66. MOST HEALTHY STATE OF THE ATMOSPHERE.—When the barometer is below 30 inches, and the air proportionately expanded, the effects are, as I have already pointed out, debilitating in the same ratio. And on the contrary, when the barometer exceeds the mean of 30 inches, which in general is indicative of fine weather, the air is proportionately condensed, and, being moderately dry at the same time, not only affords a more abundant supply of oxygen to the system, and its product, electricity,

but also prevents the dissipation of the latter. Accordingly it is now in a condition the most favourable to health; and especially so when accompanied, which it mostly is, with a serene atmosphere and a medium temperature,—a condition which by general consent is recognized as fine, wholesome weather, being grateful to the feelings, and producing a sense of lightness and joyousness of spirit, the distinctive attributes of health.

67. ELECTRICAL CONDITIONS OF THE ATMOSPHERE.—The air at all times contains a certain amount of free electricity; but of this as an influencing agent upon the system, we know little; much will nevertheless suggest itself to us, from what we do know of certain electrical states of the air influencing other chemical operations of nature, of analogous import with those which take place in the blood and animal system: for instance, the change in the electrical condition of the air which attends a thunderstorm addling eggs, and thus destroying their vital capabilities; the same electrical condition of the atmosphere subverting and arresting the process of fermentation, and thus souring beer, under circumstances in both cases, however, of particular exposure to its influence. Fish in ponds too, it is said, are in some cases killed by the same agency. These are cases that may be mentioned in illustration, which, from their importance and analogy with the chemical operations going on in the animal system, lead to the inference that a negative or suddenly altered condition of the electrical state of the atmosphere, in relation to that of the system, and to the chemical changes going on in the blood, may be in reality an agent of no mean importance, and especially so in giving rise to variety in, or modifying, many diseases of general or epidemic influence.

68. THE EFFECTS OF VARIOUS WINDS.—The force of the wind, as well as the direction of the current, or point of the compass from which the air blows, are also circumstances not undeserving notice. The force or rapidity of the wind materially modifies the effects of temperature upon the system, as all of us sensibly experience. Captain Parry mentions, in the account of his Arctic expedition, that, with the thermometer twenty degrees below zero, his men could go about freely when the air was calm; but with a wind they dared not venture to move from the ship, when the thermometer was twenty or more degrees higher, the effect was so chilling. The cause of this is obvious: the cold particles of the air being brought in such rapid succession into contact with the body, the latter is deprived of its heat faster than it is

generated,—like a person putting on a constant succession of cold shirts, instead of continuing in one, which soon becomes warm.

The influence of particular winds or currents of air must necessarily bear reference to each particular place or locality, with reference to surrounding and often very distant causes,—malarious impregnation and blight, as well as insects, sand, and ashes being known to be thus carried to incredible distances.

An easterly wind to us in England is in general cold and dry ; and in the spring insalubrious and blighty, from the great extent of continent over which it has passed, and the malarious exhalations and other terrestrial emanations it has imbibed in sweeping across the marshes of the Low Countries, which lie in its direction. The wind from the west is pure, and, when not too humid from the vapour of the Atlantic (which it is too apt to be in our Western Counties—and hence the relaxing character of the climate of Cornwall and South Devon), it is soft, balmy, and congenial to health. The wind from the Arctic region is cold and bleak. That from the south, on the other hand, is in general dry—and warm too, occasionally.

69. SOIL, ELEVATION, AND SUN'S INFLUENCE.—To these brief general observations I must now add a few others, on the influence of the more immediate surrounding causes affecting the salubrity of the atmosphere—as soil, elevation, exposure to the wind and to the sun's rays, and so forth. With respect to the first, a gravelly or chalky substratum of soil is much to be preferred, its porosity not admitting of puddles or accumulations of water taking place upon the surface, which contribute to the growth of vegetation and to its decay also, and in consequence to damp, and malarious exhalations. With respect to elevation, the source of the air's deterioration being the earth's surface, the higher we are elevated above the general surface of the surrounding country, the purer necessarily must be the air we breathe, and in most cases also the freer from damp. Elevation of site, therefore, provided it be not too much exposed to bleak winds from the north and east, nor exposed to surrounding malarious influence, is certainly the most salubrious. Lastly, as respects the sun's power, it is well known that, independent of its genial influence upon the earth and vegetation, light has also an important effect for good upon the animal system. A shaded and obscure habitation is therefore decidedly objectionable.

70. THE BLOOD; ITS ELEMENTARY CONSTITUENTS.—Having at length completed our observations on the air, in reference to its effects, local and general, chemical and physical, upon the system, the next subject deserving our attention is the constitution of the blood—in relation to the elements, solid and fluid, entering into its composition, and derived as food and beverage, from the stomach and bowels,—an inquiry which necessarily embraces, in the first place, the subject of diet. In treating of this subject, it may first be observed that the composition of animal bodies, and man's structure, may be resolved into a few simple primary elements—namely, carbon, hydrogen, oxygen, and nitrogen. These, therefore, the principal elements, are the rudimentary and essential constituents of all dietary substances,—the lime of bones, which I have omitted, being principally derived from man's fluid sustenance—water, which contains at all times a very notable quantity of that substance.

Besides these purposes of structural nutrition, there are others to be fulfilled by diet, of no less importance to the system—namely, those of combustion and vitalization; and for these purposes, accordingly, carbon and hydrogen—the elements of both oil and coal, as furnished to the lamp in one case, and to the grate in the other, for the production of light and heat—are required in this case also. And as these abound in, and constitute in combination with a certain amount of oxygen the principal constituents of, every vegetable substance, Nature has abundantly provided man, in sustenance of this description, with three of the elements of his structure and vitality; and the fourth, nitrogen, although not an essential element of vegetable substance, nevertheless enters sparingly into the composition of most dietary substances used by man, and especially abounds in the grain of wheat. Nevertheless the air he breathes is doubtless the principal source from which man, and animals in general, derive it. In ruminating animals, or those which chew the cud, the re-mastication of the food, and its exposure a second time to the air in the mouth, may have, for one of its objects, its combination with an additional amount of nitrogen—and of oxygen also, I have no doubt, at the same time.

In addition to the four elements named, of which animal substance is essentially composed, there are other substances which, in minute quantities, enter into the composition of the blood—as soda, salt, iron, lime, sulphur, and phosphorus; which are all derived from the same sources of animal nutriment, namely

vegetable food and water, and doubtless are to a certain degree essential to animal organization, although they do not fulfil so prominent a purpose as the elements before mentioned.

71. THE PROXIMATE PRINCIPLES OF ANIMAL NUTRITION.—The elements previously named—carbon, hydrogen, oxygen, and nitrogen—in combination with one another in certain definite proportions according to certain laws of chemical affinity, produce, in vegetable growth, the immediate or proximate principles of animal nutrition, namely, starch, sugar, oil, and albumen; and as all these, as Dr. Prout justly observes, “unite in the composition of milk,” milk may be assumed to represent the type of a perfect aliment; and it accordingly is that provided by nature for the young of all animals of analogous conformation to man. And as these elements, combined in the form of protein, Liebig says, exist in vegetable substances even in closer approximation to animal structure than those we have already named—starch, oil, and the like—this protein, being received into the blood as a constituent of vegetable food, or of animal substance (in the composition of which it is said to be the essential constituent), the organization deriving it from the blood has only to combine with or re-arrange its particles, in accordance with the requirements of its tissues, or as the exigencies of the system may require, to enable it to fulfil all the purposes of nutrition.

72. THE BLOOD'S PURIFICATION.—The other or unappropriated constituents of the food, as well as the *débris* of the old structures of the system, or worn-out particles, which become re-absorbed into the blood during the course of its circulation, are now combusted by their union with the oxygen received into the blood from the atmosphere, and expelled through the agency of the lungs and skin; or, entering into other combinations, are eliminated from the blood by the various secretive organs—the liver and kidneys more particularly, and are thence expelled, in common with the other excretions, from the system.

73. VEGETATION, THE PRIMARY LINK OF ANIMAL STRUCTURE.—The task, as Dr. Prout justly observes, of forming the proximate principles of the blood of animals, is left to plants, which, I may add, as life-possessing bodies, are endowed with the capacity of collecting, combining, and transforming the impurities of the air, and the foulness of the dunghill, into the fragrance of the rose, the deliciousness of the peach, and the nourishment of wheat-corn for man's use; and by the higher state of vitality

with which man's system is endowed, in common with the rest of the animal creation, he has the power further to transform them into his own substance.

74. **MAN'S OMNIVOROUS CHARACTER.**—The vegetable creation alone, conjoined with the air, it may be observed, abounds in all the essential elements of animal nutrition, and man's structure. But Nature, in her bounty to man, and in order that his race may inhabit the whole earth, has not confined his diet to vegetables alone, but has given him the power also of converting the substance of other animals into his own kind; and we accordingly find both his teeth and stomach adapted to this omnivorous condition of his existence. Hence in the the higher latitudes and polar regions (where vegetation is limited, by the short period of the sun's genial influence, to a few months of the year) animal substance is man's almost exclusive diet. In tropical regions, on the other hand, man's diet is as almost exclusively vegetable. In the intermediate and temperate zones of the earth's surface, again, man's diet is of a mixed kind, consisting of both animal and vegetable substances. With these facts before us, a practical inference may be fairly deduced, which is, that in the colder seasons of our own climate our diet should consist more largely of animal, and in the summer of vegetable kind—which accords, not only with the desire and appetite of man, but likewise with the productions of the season.

75. **THE DICTATES OF APPETITE AND COMMON SENSE MAN'S PROPER RULES OF DIET.**—Moreover, I should observe, seeing that Nature has given to all animals the faculty of discrimination and selection of what is good and best for the sustenance of each kind respectively, it may fairly be inferred that an endowment so essential to the well-being of his nature has not been withheld from man by his provident Creator, and that, accordingly, he may be left safely to the guidance of his desires, and to the intuition which is natural to him, to have recourse to such articles of diet as best accord with his appetite and necessities at the time being, without rule from us or any one as to kind,—but with this reservation as to quantity, that moderation be at all times observed, and no incongruity be admitted of as to admixture—though variety may be very properly recommended at suitable intervals. It is, however, to be observed that, in according so great a latitude, I am distinctly to be understood as confining my observations to dietary substances of a simple kind, excluding necessarily the thousand and one hetero-

geneous compounds which the artificial habits and vicious propensities of our social system have introduced into use.

76. QUANTITY OF FOOD REQUIRED, DEPENDENT ON SEASON AND EXERCISE.—Before dismissing the subject of diet, I must be permitted to add, for the information of those who desire to know the amount of aliment essentially necessary for man's sustenance (as much error prevails on this head—some persons fancying they cannot take too small a quantity, and others, on the contrary, thinking they cannot eat too much), that, to maintain the strength and weight of the body, the quantity must at all times bear reference to the exercise of the muscular system, and consequent expenditure of nervous power and combustible elements of the blood, or the exertions of a physical kind more particularly required of the individual. Experiments of a direct kind have established beyond doubt, that the expenditure of carbon in the system, evolved from the lungs as carbonic acid gas, bears a direct proportion to the increased frequency and amount of respiration called into action by physical exertion, and called into action necessarily, to maintain an increased expenditure of power. An increased quantity of food to support this is accordingly required; and if this quantity be not furnished, it will be derived from the absorption of the fat of the system, or, if this is not available, the disintegration of some of the structural tissues of the body. Fat, be it observed, is in reality no part of the body's structure, but simply a deposition between the textures, like honey in its comb—a store of nourishment in reserve, to be employed in this way on every occasion of necessity, or privation of food, and provided more especially for the uninterrupted maintenance of the combustion and vitality of the system. In short, it must be obvious that, were it not for a provision of this kind, the all-consuming fire within, resulting from the inspiration of oxygen, would destroy us on any trivial disease of the digestive organs taking place, by which the necessary supply of fuel or sustenance should be interrupted. In this manner is the vitality of the dormouse, and other hibernating animals, maintained; that is, by the fat which they accumulate in the summer season, which serves them as fuel, or food, during their state of torpidity, and with which being thus further clothed as with a garment when they retire into their hiding-places, they are less readily deprived of their heat, and thus is their proper temperature maintained.

To revert to our subject. With passive exercise, or that involving no great muscular exertion, a man, it has been estimated, will require, to maintain his strength, from ten to twelve ounces of solid carbon daily: his food must therefore be in proportion to this necessity of his existence; and the quantity of the whole, or one or other of each kind, of the substances taken by him must therefore bear reference to the amount of carbon contained in each respectively, or its equivalent of hydrogen—of which the subjoined table will give a pretty accurate idea*. If much exertion be required of the individual, the quantity must be proportionately increased—say, to fourteen or sixteen ounces. It is obvious, therefore, that a man's diet can in no case be a constant quantity, but must fluctuate with the season of the year, and the exercise taken by the individual. This table exhibits the proportion of carbon and hydrogen contained in one hundred parts of the principal alimentary substances employed by man:—

Raw flesh, without fat or bone, either of fowl	Per cent.	
or beast	14	say $\frac{1}{4}$ th part.
Cooked meat (as it contains some fat).....	20	" $\frac{1}{5}$ "
Fish.....	15	" $\frac{1}{7}$ "
Fat, Bacon, Lard, &c.	80	" $\frac{4}{5}$ "
Eggs	40	" $\frac{2}{5}$ "
Cheese.....	40	" $\frac{2}{5}$ "
Butter.....	70	" $\frac{7}{10}$ "
Milk.....	10	" $\frac{1}{10}$ "
Bread (stale)	30	" $\frac{1}{3}$ "
Flour (oatmeal)	40	" $\frac{2}{5}$ "
Starch, Arrow-root, Tapioca, &c.	44	" $\frac{2}{5}$ "
Sugar	42	" $\frac{2}{5}$ "
Rice.....	40	" $\frac{2}{5}$ "
Potatoes	12	" $\frac{1}{8}$ "
Fruit	12	" $\frac{1}{8}$ "
Vegetables, in common.....	10	" $\frac{1}{10}$ "

77. THE NUTRITIVE QUALITIES OF ANIMAL FOOD.—The principal constituent of vegetable food is carbon. Of wheaten bread

* The diet of our soldiery offers a pretty fair estimate of what is required in this country. A finer body of men is certainly not to be found in Europe. Their daily rations consist of $\frac{3}{4}$ lb. of meat, including fat and bone, and 1 lb. of bread: to which they add one pennyworth of vegetables—(say $1\frac{1}{2}$ lb. potatoes on an average)—and pay twopence for their coffee and tea—which contain 2 oz. of sugar and $\frac{1}{2}$ pint of milk: they purchase also butter or bacon to the amount of about two ounces of each, and drink about two pints of beer (porter) upon an average daily. The whole will be found unitedly to contain a trifle less than 12 oz. of carbon and hydrogen.

(divested of every particle of moisture), it will have been observed, thirty per cent. of its weight consists of carbon, with which is combined about two per cent. of nitrogen. Dry muscular substance—the flesh of meat—contains fifty-four per cent. of carbon in combination with fifteen of nitrogen. Raw fresh meat, as it contains in combination a threefold weight of water, possesses fourteen of carbon and four of nitrogen. To the latter constituent, its more nutritive qualities have been ascribed: but this I believe to be true only in part. Its more nutritive quality I would rather attribute to the existence of these elements in the required proportions, and in combination also with other essential constituents of the blood, as well as to the facility of its mutation, or its conversion by the assimilating organs into blood,—blood, indeed, being nothing less, and but little more, than fluid flesh!—its composition consisting of fifty-two parts carbon, seven hydrogen, fifteen nitrogen, and twenty-one oxygen.

78. NITROGEN, THE CHARACTERISTIC ELEMENT OF FLESH, WHENCE DERIVED.—From what has been said, it will now be readily discerned why the pig in the sty, superabundantly fed, becomes enormously fat, whilst the wild hog, which roams the forest in search of his food, in common with other wild animals, is proportionably muscular, and as free from fat. The essential difference between muscle (flesh) and fat is the addition, to the elements of fat, of the other necessary constituent of muscle—namely, nitrogen. This, accordingly, is received into the blood from the air, by the more active respiration which follows increased exercise of the muscular system, and the more vigorous circulation of the blood which attends it—conditions that would appear to be necessary to effect the combination of the nitrogen with the other elements of animal substance. And thus the muscularity of the labouring man, who feeds almost exclusively on vegetable diet, compared with the delicate female, who takes but little exercise, whose diet often abounds in animal substance, and who, perhaps from her sedentary habits, requires therefore to be thus supported. Hence muscular development—muscle being the instrument of motion, and consequently of strength—is proportionate to the exercise taken; and thus do the arms of the smith, and the shoulders and legs of the porter, become so largely developed. How beautiful a law of our nature is this, whereby the strength of the individual is proportionate to the requirements of his condition! Animal food, no doubt, tends to the more perfect nutrition of the system—being replete with all

the elements of man's structure, in a condition more readily assimilated to, and available for the requirements of the system; and no doubt from this cause, the same bulk of animal food is more immediately nutritive than an equal quantity of vegetable food. Fat, however, is certainly the most concentrated form of nourishment, both respiratory and structural; but, as this contains no nitrogen, and requires an active condition of the digestive organs for its assimilation, active exercise is an essential condition to its mutation; and it is accordingly best adapted to the labouring class, with whom, as bacon and lard, it constitutes a favourite article of food. The superiority in flavour of the Welsh, South-down, and Scotch mutton, like the flesh of wild animals, is due, I have no doubt, to the circumstance of these animals having to roam far and feed upon a scanty herbage,—developing, by the more active exercise required of them, the most exalted degree of animalization—muscular substance instead of fat. Fat abounds in the Leicester sheep, fed on the richer plains, or in an abundant pasture, as well as in the stall-fed ox. Thus fat may be said to be muscle *minus* this element of the air—nitrogen,—an idea, if not fact, well supported by the circumstance that muscle may be, and is, thus converted, after a time, into adipocere, a fatty substance found in our burial-grounds, flesh being thus transformed, during the period of its interment, by parting with its nitrogen by gaseous exhalation*.

* It will be observed that I have assumed the nitrogen of flesh to be derived from the air. I do so most certainly; the amount furnished as a constituent of vegetable substance can never supply the quantity required. It exists in vegetables to the extent, upon an average, of little more than one per cent.; and this, I maintain, is no essential constituent of the vegetable structure, seeing that the quantity in grain is variable, dependent upon the nature of the soil and the manure employed, and, I should therefore say, extraneous rather than essential: for sugar, starch, and the *essential* products of vegetation consist of certain elements in definite proportions at all times; and these are without nitrogen. But, setting this view aside, the argument may be much better maintained by a simple consideration of the acknowledged fact, that nitrogen constitutes no less than four-fifths of the atmosphere; and Nature, we may be assured, in her economy of means, never designed it to fulfil the insignificant purpose of simply diluting the remaining one-fifth of oxygen, to which is justly attached so much importance in the animal economy. Animal vitality is acknowledged to be derived from the air we breathe; and as experiments prove that life cannot be maintained, but for a very short period, by the inhalation of oxygen alone, it is clear to my mind that nitrogen therefore must fulfil some very important purpose. I know, when oxygen has been respired, it is said the animal dies from excess of excitement; but this is mere

79. WATER, AN ESSENTIAL CONSTITUENT OF THE BLOOD.—Another essential constituent of the blood, and of animal sustenance, is water. It constitutes no less than four-fifths of the weight of the blood, and enters in an equal proportion, or nearly so, into all its products; three-fourths of the weight of flesh or muscle consists of water. Water, thus constituting so large a proportion of animal bodies, is not only the medium of nutrition as it gives fluidity to the blood, by which it is circulated, but is also essential to secretion and every other change that takes place in the blood's composition. Surrounded as animal bodies are by an atmosphere colder and drier than themselves, the quantity of water they contain is liable to perpetual change. Accordingly we find that aqueous vapour is freely exhaled from the body, being evaporated by the agency of our inward heat, and passes off by the skin and lungs. It is also, under particular circumstances of privation, as freely absorbed from the atmosphere by the same organs: thus we read of a jockey, who had been sweated down and reduced in weight by abstinence and exercise, acquiring, after drinking a single glass of wine, not less than three pounds additional weight, which could only have been derived from the atmosphere. It has been determined by experiment, that, under ordinary circumstances, nearly three pounds of fluid are lost by exhalation from the skin and lungs daily, in addition to what is excreted and passes from the system in the form of urine, which amounts to about two pints upon an average during the same period; a proportionate quantity of fluid beverage must accordingly be supplied to the system.

80. MAN'S PROPER BEVERAGE.—I am led, in the last place, to observe that the only essential beverage for man, as well as for the

assertion; there is no evidence of any unusual excitement. On the contrary, let the animal respire the protoxide of nitrogen, and what is the case then? Great excitement follows—more than is commensurate with the increased amount of oxygen entering into the composition of this gas, and its solubility in the blood. How is this to be explained, I would ask, if not arising from the nitrogen which constitutes so large a proportion of its composition, and in consequence of its existing in this compound in a condition more amenable to combination with, and to a higher degree of vitalization of the blood? The excretions of a labouring man with a well-developed muscular frame, living almost exclusively, in the agricultural districts, upon vegetable food, must contain nitrogen in an amount exceeding that contained in his food. And look at the elephant! whence is this mountain of flesh derived? Fish and leeches, kept in glass vessels of pure water, not only live, but increase in weight and size: now, as nitrogen is an abundant constituent of their structure, whence can it be derived, but from the air which exists in combination with the water?

rest of the animal creation, is—water. It is the most natural, the most wholesome, and—all will admit—the most simple and abundant drink. The too common use amongst mankind of beer, or wine, and all other spirituous and exciting beverages, is the perversion, in our social habits, of the Almighty's gifts from the purpose to which they should be confined, namely, to serve as occasional cordials and renovators of the system under enervation—that is, defective supply of electro-nervous power—or exhaustion.

81. SPIRITUOUS BEVERAGES; THEIR NATURE AND OPERATION. —After what I have said in condemnation of the habitual use of spirituous beverages, I am perhaps bound, in support of my opinion, to give an explanation of their operation on the system. Their effects as excitants are well known to every one; but the *quomodo* of their operation is the subject to be explained. There are two modes by which they may operate: one is, the direct effect of their absorption into the blood—their stimulating operation on the various organs and structures with which they are brought into immediate contact during their circulation; and the other is founded upon the constitution or elementary composition of alcohol—the essential constituent of all spirituous or fermented fluids, whether beer, cider, wine, gin, or any other. Brandy and other spirits contain on an average fifty per cent. of alcohol; wine twenty, and good beer about eight. Alcohol consists of carbon and hydrogen in the relative proportions of twenty-four of the first to thirty-six of the last, with twelve of oxygen. Now, from the known affinity these elements (carbon and hydrogen) have for oxygen, and supposing them to exist in alcohol in a looser state of combination, or with a greater affinity for oxygen than that in which the same elements are united or exist in the blood as constituents of the food, we may fairly conclude that, when received into the blood in the form of alcohol, as in wine or beverage of the like description, they would unite with the oxygen existing in the blood in its free state, and a more speedy and active combination or combustion would ensue, producing the usual effects of such beverages upon the system, namely, increased excitement. In confirmation of these views, it is mentioned by Dr. Paris, that Mr. Spalding consumed the oxygen of the air in his diving-bell much sooner when he drank spirituous liquors and employed an animal diet, than when he drank only water and lived on vegetables. But, however unobjectionable this may at the first glance appear, let it be remem-

bered that this combination takes place at the expense of the oxygen which was intended to enter into certain other combinations with the constituents of the blood in fulfilling the purposes of nutrition, and for the disintegration and combustion of the deteriorated and exhausted particles of the system, which should be expelled, otherwise their retention will be productive of disease: and thus gout, rheumatism, and many other disorders so frequently follow the excess, or the habitual use, of spirituous beverage, independent of the enervation which must follow to undue stimulation—exhaustion in all cases succeeding and being equivalent to the previous excitement of the system—whence the fact that one glass of wine begets the necessity for a second, and the feeling of its want which follows the habitual use of stimulating beverages. These are the objections I have to urge against the habitual use of such beverages, believing that alcohol operates on the system in both the modes mentioned. But as an occasional cordial in certain conditions of the system, and as a medicine, alcohol, in the shape of wine, beer, and the like, may be justly recommended as a most useful excitant and restorative of nervous power.

82. EXERCISE.—Having already explained the operation of exercise of the muscular system, by the increased vigour of the heart and respiratory action it gives rise to, in augmenting the temperature and vitality as well as the muscular development and strength of the system, and confining our views at present to physical exercise in contradistinction to that of the mind (or intellectual), of which we shall speak hereafter, I may here briefly observe that exercise is an agent of much importance, in relation not only to the efficient performance of the functions, and therefore to the health of the system in general, but also in the cure of disease. For, as the talented Swedenborg justly observes, “Affections of the system in general tend either to impair life, or threaten death; they induce either heat and activity, or cold and inertia; and hence we have various changes produced in the vessels or fibres constituting the organic textures; which changes, speaking generally, are expansion or contraction, extension or retraction, induration or softening;—the effects of which in the sensorial organs are, either acuteness or dulness; and in the motorial organs, either activity or torpor.” I say, if these be facts (which they indubitably are), how all-important must exercise be to the mental faculties, as well as to bodily health,

seeing the direct power exercise possesses of increasing both heat and activity—the temperature and vitality of the system!

83. SLEEP AND WAKING, HOW INDUCED. — Having already offered some explanation of the cause and nature of sleep, as well as some of its vagaries and attendant phenomena—as dreams, somnambulism, &c.—I shall now more particularly explain how sleep, under ordinary circumstances, is induced. I must first observe, that the actuating or motive power of our existence—electricity—is, as I have already explained, derived from the air we breathe; it must therefore be proportionate at all times in amount to the quantity of air imbibed by the skin and lungs. During sleep, the organs of voluntary motion, as well as those of the senses and mind, being in a state of repose or inertia, the involuntary or vital organs—the heart, the digestive organs, and their associates, including also those of the generative function in the more active periods of our existence—gradually accumulate power (hence, in the latter case, the *signum salutis*)—until, the quantity accumulated exceeding the necessities of their condition, wakefulness is induced; that is to say, the motive or actuating power is extended to the sensorial and bodily organs—exciting them, which it now does, to the renewed activity of wakefulness and animal existence. We are accordingly impelled by the excitement of these organs to exertion,—if not in all cases, like the rest of the animal creation, to obtain the food necessary for the maintenance of existence—the decree of our nature, and rendered imperative upon all by the promptings of appetite—at least to action of some kind, mental or bodily. For the mind and its associates, the senses, are, in despite of us, unceasingly and for ever in action, in thought or in volition. And as action of some kind continues throughout the day, it ultimately expends all surplus power,—or quantity exceeding what is produced at the moment, and indispensable to the maintenance of the more immediately vital or involuntary actions of life. And when this takes place, the mind becomes listless, and the senses obtunded,—the heart in its power of circulation becomes enfeebled, and the quantity of blood circulating to the brain and to the lungs is necessarily reduced; from which causes, diminished electrical evolution takes place, and in proportion, the action of the respiratory muscles is reduced also: hence the yawning which ensues. And as the function of respiration is twofold, not only the absorption of the actuating principle, oxygen, but the extrication from the blood also of carbonic acid

—a highly narcotic principle when abounding in the blood,—the presence of this, united in effect with the deficiency of the other, oxygen, operates conjointly to diminish activity in all the functions; when finally, as a consequence of defect of nervous excitement, abeyance of the sensorial and mental functions, or sleep, is induced. This is necessarily more or less perfect, in proportion generally to the expenditure of power and exercise of the previous day, and of the muscular system in particular, which withdraws it from the brain, and thereby relieves that organ from any undue excitement—which otherwise is apt to excite it to thought, and thus prevent its repose. The tendency to sleep in fat persons is in like manner induced by the reduction of the respiratory function,—the fat located about the kidneys and the heart preventing the descent of the diaphragm and the full expansion of the lungs; and especially so when the stomach is distended by a full meal, which further operates to withdraw electrical excitement from the respiratory to the fulfilment of the digestive process. And hence too the tendency to sleep after a full meal—the distension of the stomach preventing the full expansion of the lungs. The prototype of sleep in its connexion with respiration is thus furnished in the hybernating state of some animals, and illustrated also in the analogous condition of the foetus in utero, as I have elsewhere pointed out.

84. MENTAL EXERCISE AND THE INFLUENCE OF MORAL CAUSES ON THE SYSTEM.—The fund of electro-nervous or actuating power, it will be remembered, is a limited quantity, proportionate at all times to the perfection of the chemical changes going on in the blood, and the consequent action of the capillary vessels,—effects though simple in their nature, yet essentially dependent upon the efficient performance of the more complex and elaborate functions of the several organs concerned and associated in the processes of the formation and perfection of the blood, viz. respiration, digestion, assimilation, circulation, and secretion. And as the performance of these several functions is dependent upon an efficient supply of nervous power, it is obvious that, as an available power for other purposes, this fund must necessarily fluctuate constantly in amount, and be at all times limited to the quantity over and above that required for the excitement of the functions mentioned, and which is indispensable to the life and health of the system. Hence it is, that at one time we are capable of any undertaking, mental or bodily, and at another time

fit, as it is usual to say on such occasions—absolutely fit for nothing.

85. THE JOYOUSNESS OF YOUTH.—The joyous and ecstatic feeling of health experienced, by youth more especially, when the mind is free from care or anxiety, we may presume, therefore, is connected with an abundant exchequer—an overflowing income, of nervous power. And on the other hand, the sense of lassitude and inertia at other times felt, may be as reasonably attributed to a proportionate deficiency of this fund.

86. THE BRAIN AND STOMACH ANTAGONISTIC ORGANS.—The brain, in its office of thought and the various intellectual functions, must therefore, in its exercise, stand in the relation of an agent antagonistic in character to the efficient performance of the functions before enumerated, which, from their essential importance to animal existence, are emphatically called the vital functions. And thus it is, that care and anxiety, or the undue exercise of the passions—by the expenditure which they occasion of the nervous or actuating power, and its concentration on the brain—are so wearing to the energies of the system, and accordingly destructive to health. And for the same reason, extreme fright, sudden joy, or the like excessive perturbation of the mind, is occasionally attended with immediate death,—the sudden arrest of nervous power from, and non-fulfilment of the functions of these all-important vital organs being the occasion of this result. And again, on the contrary, as I have elsewhere observed, the reason why “fat paunches have but lean pates” is clearly attributable to too large a quantity of the nervous power being thus expended on the stomach and its associated organs. Mr. Cunningham observes, “A thinking man is at all times an unsteady walker, being liable to trip at every stone, or to be pitched off his perpendicular by even the slightest push, from having less electricity in his heels than in his head; while the less thoughtful trips nimbly along without a stumble, from there being more electricity in the former than in the latter.” The amount of this fund of electro-nervous power, and man’s income of it, in the ordinary circumstances of health, is without doubt equal to all the real necessities of his condition: all that is required of him is to be careful that he does not, at the expense of his personal and more real necessities, spend too large a portion of this income in the adornment of his mind, and on other objects of the like nature, less essential to his well-being. This subject has, however, been so ably treated by Dr. Keenan, in some

papers in the *Medical Times* of 1844, that I shall conclude this article with the following lengthened quotation, as it is replete with interest and instruction of the most valuable kind, with reference not only to health, but to education also :—

87. THE BRAIN'S POWER, AND THE INFLUENCE OF EDUCATION ON THE BODILY ORGANS.—“ Now, this fact in the human body—the centralization of the electro-nervous power—is generalized ; for when we will to look intensely, we find the nervous energy is so concentrated on the organs of vision, that we hear less readily, nor would a slight impression of touch be so sensibly felt. In like manner, we can direct by the will the nervous supply to the organs of taste, to the deprivation of the eyes, ears, &c. ; and in the case of taste, no doubt sapid substances co-operate with volition in concentrating the energy to the organs in question. It is also well known that in digestion, when the meal is too large in quantity, and of an intractable nature, such a supply of nervous power is required by the stomach, that it is withdrawn from other organs of the body, making the head dull, and the limbs feeble. A most remarkable instance of the power of one organ of the body to monopolize or centralize the animal forces on itself, is exhibited by the uterus, in cases of parturition. This organ, in order to enable it to overcome the opposing resistance, actually deprives, when it is in perfect and efficient action, every other part of the body of power : the stomach being often, in consequence, unable to retain food ; the eye dull, and lazily opened ; the motion of the limbs slow and laboured ; the voice guttural, from want of energy in the muscles of the glottis to produce a sufficient degree of tension in the vocal chords, so as to articulate a sharp note. All these phenomena indicate a loss of energy consistent with its centralization on the uterus, and are facts which indicate the existence of a fundamental law, namely : that the human organism has a fixed amount of energy, generated in breathing ; that this amount is the common stock, from which must be drawn supplies to all the organs ; and that while it may be, through the agency of the will, and objects acting on those organs, solicited dominantly to *one* in preference to another, yet it cannot be supplied dominantly to all, or even to many, at the same time. Thus, by immoderate eating, the animal force is expended in the digestion of food, while it is withdrawn from the brain, where it was necessary to the sustentation of feeling and of thought. Again, if habit and volition centralize the nervous energy upon the forehead,

where it is necessary to sustain the cerebration implied in thought, it is then drawn from the stomach, from the limbs, and from the emotional organs; so that the person becomes at once sedentary, subdued, and cooler in his affections, and clear and effectual in his philosophy. There is one fact that falls under this law, which is too important to be omitted,—namely, that the strength or energy employed in the growth or nutrition of the animal machine, is the remainder which is left after all the various other functions have been sustained. Thus, if there be too much expended in thought, or even in the sustentation of some of the affections, or too much in the digestion of food, or too much in muscular action as in hard labour; there is then such a draft made upon the stock generated in breathing, that there is too little left for the organizing, formative function: the body is badly built up, and the textures are weakly held together. To make this more intelligible, it must be remarked that the molecules or globules of fibrine, which form the muscular fibre, are held together by the same chemical or electrical force as that which sustains the animal machine in motion. When the organizing force is feeble, which must always be the case when too much is otherwise expended, the fibrinous globules are both badly formed and loosely held together, and consequently there is produced a defective muscular fibre. Now, without expatiating on this topic, it is easy to understand how expenditure of energy in various functions leaves a residue too small for perfect organization. Hence, we often find scrofulous constitutions connected with, if not produced by, excessive cerebral activity. Similar causes, operating on the parent, produced in the offspring scrofulous constitutions. Hence it happens that distinguished and overwrought parents seldom transmit, with their fame, a healthy constitution to their offspring. Indeed, the pallid cheek, the leaden eye, and softened muscle, in the severe student, clearly indicate the failure of the organic functions to be contingent on the exaltation of the cerebral. Indeed, if we note, minutely and accurately, changes that take place during progress in education and so-called improvement, we shall far more frequently find that one power has been changed into another, rather than that new powers have been created. Thus, the son of a farmer goes as a student to one of our universities: he is strong, vigorous, and active; his colour is ruddy, and his eyes sparkling. The action of his senses is not so quick: he more slowly receives impressions from without, and less rapidly acts upon these impres-

sions. Still more is his ratiocination slow. His power of combining and disuniting facts, for the purposes of mental analysis, is almost nothing. You see him again at the expiration of three years: the well-formed muscle is shrunk; the calf of the leg has lost much of its healthy plump contour: the skin, from being fresh and animated, is pale, if not shrivelled; the step is less elastic than before; and the once hardy and robust youth moves forward with a slouching gait, implying, in his very motion, that all the interest which he once felt in the external world or surrounding objects has ceased, and that he no longer exists or takes delight in what he previously did, but in its stead revels in a world of his mind's formation. Well, he has gained the power of mental analysis, but he has lost many of his capabilities in regard to the objective world. We shall not here enter on the question, has the ardour of the moral sentiments abated?—as the mind revolts even from the conjecture, that the perfection of its psychological nature implies a defect in the subliming heat of the emotional. Accurate observations of this kind, carefully noting that every gain is at the expense of a corresponding loss of power, will convince every one, that the human body under the same conditions of food and air, and moral appropriation, is provided with a certain amount of available strength and spirit, which, in the language of science, may be called a constant quantity; and that when much is expended for one purpose, there remains proportionately less to be expended on others. The application of this doctrine to practical life is very important, as tending to impose checks upon parents, teachers, and others, and also on young men, ambitious of universal excellence. Such persons are far from knowing that in the fact of perfecting one faculty they are deteriorating another; when they are rendering the head more clear, they are at the same time making the heart more cold, the power of muscular motion less, and vitiating the process of growth and nutrition. Hence they are often surprised, after all their labours, to find that he, on whose every faculty and power the utmost care and attention had been bestowed, is after all, no better than his less cultivated neighbour, and that in the real business of life, because the latter is a more natural man, and therefore allied to other men by a greater number of affinities, the latter will often advance before him. So that 'if reason be the card, and passion be the gale,' we shall say that the human bark, in the sea of life, has to pay for the perfection of the one, by adopting an imperfection of the other,

on the principle that defect implies perfection, and perfection defect. The reader may receive this with some repugnance, as not being very gracious in the constitution of our nature; yet it is the result of the most wise and beneficent arrangement, and is also most beneficial in its operation. The constitutional arrangement out of which it springs, is this:—to have maintained every organ or function of the human body in dominant activity, would have required a greater amount of respiration and digestion, and of the resulting galvanoid or electrical force, than man, as at present modelled, could afford; and for that reason, instead of all his organs being kept in dominant activity at once, they can only be plentifully supplied in turns, so that the activity of the one implies the repose of another; and also, the human subject can exhibit in succession a greater range of mental and bodily activity, than could have appertained to man, if all his powers had been acting coetaneously. But this difficulty of maintaining many faculties in action at once, is highly beneficial in the constitution of our nature in other points of view. It is the principle by which Nature dispenses her gifts, by a determinate limit, more favourably to one person than to another; for by exalting the first above the second in one particular, she secretly sinks the first below the second in another, and thus brings the two more nearly on an equality than either party may suppose; and by way of comfort to each, she makes him take cognizance only of the faculty in which he excels, and thus renders him insensible to that in which he does not excel; so that each is left in the cheering, hopeful, and healthful conceit, that he is more excellent than his neighbour."

88. IMPORTANT OBSERVATIONS ON THE EDUCATION OF CHILDREN.—Now, if there be any truth in the observations quoted in the last paragraph, and beyond doubt there is, how all-important to the after health and happiness—"our being's aim and end," must be the system pursued by parents in the bringing up and education of youth. In the few remarks I am about to make on the subject, I would appeal to the common sense of every parent, as to the truth and justness of what I say. Seeing, then, that the happiness of the man is so materially dependent on his health, and this upon the proper growth and physical development of early life, should not the latter overrule every other consideration held in view in the child's education? Yes, you will doubtless say! Well then, act in accordance with this conviction; and do not let the current opinion of the day mislead you—to lay the

foundation in your child of a weakly constitution and over-sensitive mind—by determining the nervo-electrical and motive power of the system to the *brain—dominantly*—at the expense of the digestive, muscular, and other of the bodily functions—by too early education,—a practice but too common at the present day, inflicting, as it most assuredly will, a great amount of misery on the rising generation. The education that cannot be commenced too early, is that of truth and righteous principles—of sound faith and worthy conduct: and these, to be effectual, must be inculcated by example and parental tuition, not by catechisms and scholastic inflictions. And if I were permitted to express an opinion how best done, I would say, by taking the child into the garden and into the fields, and there, in the spring season, directing its attention to the beauties of Nature, and bounties of our beneficent Creator, as displayed in all around—the humming of the bees—the joyous carolling of the birds—the beauty and sweet scent of the flowers—the sun's warm and cheerful rays—the corn's growth and fruits of the coming season,—evincing, in all things, that ours is the God of Love, and to love him as he loves us, and our neighbour as ourself—as he has commanded, and as the best manifestation we can make of our love to him—is not only our duty, but, with a conscience void of offence which results from its practice, is the source of the greatest enjoyment in life, or at least there can be no real happiness where this does not exist. Love should be the governing principle in our education, and in all our intercourse with young persons; this is the seed that I would sow in the fresh and verdant soil of the youthful bosom, by a constant reference to the benignity of creative wisdom, and the force of good example, instead of making little precocious men and women of them, by smatterings of poetry and trumpery of the like description. This is the only education, conjoined with that of the bodily functions, that I would inculcate, till the child had completed its eighth year; to whom, coercion or fear should never be named. Till then, the child should be allowed to run at large, and spend the day in the open air, and be taught to swim, to dance, to ride, and be encouraged to run, to leap, to climb, to face a wet day, and submit to the evils and inconveniences with which life abounds,—not caged up in a warm room, as a hothouse plant, out of which a breath of wind will blow the life—no, but brought up as a hardy oak, both strong and durable. And now, having laid the foundation of a healthy

body and a truthful mind, commence by all means the education thought necessary to the position of the man in after life. And upon this subject I beg to be permitted to add a word, in relation to a principle which is sadly lost sight of in all our educational establishments. Lord Brougham, the great schoolmaster of the age, in his late address to the working men of Manchester, says, "There are rules as to which I would allow no compromise, no middle course whatever; and they are the maxims which ought to preside over a man's whole employment of his time. One is, to do *one thing at a time* only; the next is, never to *put off till tomorrow* what you can do today; and the third is, to *finish one thing before* you begin another." These are maxims which, in my opinion, deserve to be written in letters of gold, and universally disseminated, as every man of observation and experience must concur with his lordship, that they are paramount to all others, to secure a successful result, whatever may be the purpose in view. Well then, will it be believed that in our educational establishments throughout the country, instead of inculcating these wholesome truths in the youthful mind, the system pursued in the tuition of young persons is at utter variance with and directly opposed to these wise maxims—these foundation-stones of success in the acquirement of knowledge! Instead of a youth's attention being directed to one, or even to two objects of study at a time, it is diffused over and frittered away upon half a dozen! And thus it is that every parent has to lament, on his child's leaving school, how little he has really attained from an education extending over a period, perhaps, of ten years! It was but the other day, that I visited a young friend at a very respectable school. He told me that in one day he had a lesson in Latin, and a second in Greek; and on the following day, he was taught both French and German: at the same time he was studying geography, history, writing, and arithmetic! And such is the system pursued in almost all of our educational establishments for the youth of both sexes. Nor is it confined to schools of elementary education; but it extends to our colleges also, and our schools of medicine. Thus, at University College, no sooner is one lecture over, than the bell rings, and off scampers the pupil in all haste to be in time to hear another on a very different subject; and he thus not unfrequently attends four different lectures or more in the same day! Now if these maxims of Lord Brougham be sound, which they unquestionably are, this must be a bad system—a sad misapplica-

tion of time—irrespective of the evil tendency it has to inculcate erroneous principles. And thus it is that so few know thoroughly, or appear to think deeply upon, any one subject: the mind has not been directed to concentrate its energies upon any one object; it skips among many, and over all things. Enough.

To these observations I have only to add with respect to the time and number of hours to be devoted to educational purposes. The early part of the day—while the mind is fresh and vigorous from the night's repose—is the most proper. After an early breakfast and a short walk—let the duties of the day commence. And let the number of hours devoted to education, commencing with one hour (and this rendered as attractive as possible by pictorial display and the like, to give the child a relish for such occupation), be gradually extended with the age; and its severities or closeness of application also, as the principle should be sedulously inculcated in every youthful mind—that nothing in life worth the possession is to be attained without effort of some kind. And thus progressively extend the period till it shall have attained to six hours' application per diem:—which for good is the maximum length of time that any one—man, woman, or youth, should devote to mental exertion—who would enjoy length of days and maintain a sound mind in a sound body—which are man's best possessions. And these six hours should not be in continuation, but, say, from nine to twelve, and from two to five—and then away with the books, and let the rest of the day be devoted to life's purposes—exercise and enjoyment. And in conclusion I must add, if the maxims of Lord Brougham were systematically carried out, and education thus based upon studying one thing at a time discreetly adopted, no youth could fail, under a discipline of this kind extending over a period of eight or ten years, of attaining an amount of education which would render him equal to fulfil the requirements of any position in life.

89. EXCESS OF MENTAL EXCITEMENT.—In conclusion of the subject of mental employ, I may add, that the action of the brain is, like every other function of the system, increased by moderate excitement, but paralyzed by excess. Thus, in anger we speak and act with energy, but in rage can say and do nothing; and thus it is that extreme fright prevents a man from running away or assisting himself. And again, when the mind is over-excited by the force of its conceptions or by too active engagement, language in one case, and ideas in the other, will not flow,—a

state which I have often found remedied by the diversion of the actuating power from the brain by the exercise of the muscles in a walk,—which fact readily explains how some persons can best study and compose, as the peripatetic philosophers did of old, whilst walking composedly.

Having at length completed an explanation of the nature and cause of life, and of the structure and functions of the several organs concerned in the formation, renovation, vitalization, and circulation of the blood, and of the influence of the latter as the fountain-stream of life in the maintenance of health; and having explained also, the operation and influence of the numerous external causes and agencies of every description, by which the system is surrounded, and affected for good or for evil—the maintenance of health, or the production of disease,—I shall in the next chapter, after making a few prefatory observations on the characteristics of health, and nature of disease, proceed to explain what constitutes the fundamental character—the essence or pathological condition, of every disease;—the cause of the varieties or complications of disease,—and the general principles to be pursued in the treatment of every disease.

CHAPTER IV.

HEALTH AND DISEASE, THEIR ESSENTIAL CHARACTERISTICS.—THE CAUSES OF DISEASE.—THE PATHOLOGICAL CONDITION OF THE PARTS AFFECTED BY, OR ESSENCE OF EVERY DISEASE.—THE NATURE AND CAUSES OF THE MULTITUDINOUS VARIETIES OR COMPLICATIONS OF DISEASE.—AND THE GENERAL PRINCIPLES OF TREATING EVERY DISEASE.—THE WHOLE ILLUSTRATED IN THE PHENOMENA OF FEVER, WHICH IS HERE EXPLAINED.

90. LIFE—ITS SOURCE.—In the former part of this work, relating to life and health, I have represented—that the primary condition of animal existence is that of organic life—or that manifested in capillary action, or the motion which is excited in the

capillary vessels by the electricity developed in the fluid blood they contain. And this electrical development and this motion, I have said, take place as results of the chemical affinities existing in, and combinations which are effected between, the atomic or elementary constituents of the blood and its aerial admixture, under the favourable circumstances of the existing high temperature of the vitalized or coincident electrical condition of the blood. The caloric of the blood, which gives temperature to the body, I have observed, is, with the electricity, simultaneously developed, by the combustion of the carbonaceous and hydrogenous elements of the blood, concurrently with the other changes of a chemical character which take place in its composition, in relation to nutrition, secretion, &c.,—the caloric evolved being thus opportunely furnished for the perpetuation of the process. In like manner as the heat developed by the combustion of the fuel in the fire-grate perpetuates the process of combustion, and keeps up the fire—light also being simultaneously developed in this case, as electricity, its analogue, in the other is developed in the blood.

91. HEALTH—ITS CHARACTERISTICS.—If such be the motive power or actuating principle of life and its source, and the associated inherent warmth of the living body; health—the normal condition of life, must consist in, or be essentially connected with, the due and perfect evolution of caloric and electricity, and the action these maintain in the capillary vessels with the functions the capillaries fulfil in the circulation of the blood and the nutrition of the system. The manifestations of health resulting, must accordingly be, in addition to a well-nourished system, an equable and agreeable temperature of the body, conjoined with a vivacious aptitude to exertion, resulting from an abundant exchequer or a goodly amount of electro-nervous power—the actuating principle of life: and such are the evidences of health that we so generally find to exist. The due action of all the organs of life—of which the capillaries form so large a portion of the structure—is obviously therefore dependent upon, and coincident with, the changes which are effected in the blood and the action of these vessels,—and is essentially subservient to the performance of these actions—the primary and rudimental functions—the functions of organic life.

92. CONDITIONS ESSENTIAL TO HEALTH.—The primary elements of health would therefore appear to consist in the quantity, proportion, and fitness of the materials—solid, fluid, and

aërial, that is to say, alimentary and respiratory—which enter into the composition of the blood; influenced by a suitable or given range of external temperature. To these conditions must be added the integrity or perfectness of the organs of the body at the time being, as essential to the due performance of their respective functions, in the acquisition and reception into the system of the blood's elementary constituents, and in the blood's elaboration, circulation, and purification,—as the blood contains the pabulum both of life and heat, as well as the rudimental or raw material for the nourishment and structure of every organ and part of the system. To these conditions, we must however annex the proper condition and action of the brain and nervous system, as the recipients and distributors of electro-nervous power—the organs of direction, supervision, and association of all the functions—the imparters of power, derived from the capillary system, to all the organs of the body, whose functions may therefore, and often do, become impaired through the instrumentality of mental emotions and moral influences, acting upon and through the brain and nervous system. Thus, in illustration of such influence, may be mentioned sudden and severe fright, which is often seen to paralyze all the powers—preventing the individual from stirring from the seat of danger, or calling for or doing anything for his own assistance:—this operates by suddenly calling the brain into dominant action, or rather by concentrating the whole fund of electrical power upon its emotional functions, to the deprivation and palsy of its more important functions for the time being: and to the extent sometimes of occasioning death, by the absolute paralysis of the vital organs, which become thus deprived of power. The sickness of stomach which succeeds to the sight of an object of disgust, or the flow of saliva into the mouth which attends the smell of a savoury repast, and the instincts of the sexes, may be also mentioned as instances of similar import.

93. DISEASE—ITS NATURE AND CAUSES.—If what I have advanced be true, the derangements of health, or disease, must as necessarily consist in the disordered or less perfect way in which those chemical combinations and changes in the blood are effected—by which the heat of the body, nutrition of the system, and capillary action or organic life are maintained, as they are influenced by one or other or a combination of the following causes, or principally so; which, accordingly, it may be assumed, are, as indeed we find them to be, the principal causes of disease

(mental emotions and suchlike causes we except from consideration for the present). The first of these causes is the external temperature and condition of the atmosphere—as humidity or dryness, &c.—in relation to its effects upon the system, primarily or secondarily induced, locally or generally, on the superficies of the body, or when inspired into the system : primarily on the pulmonary or cutaneous surface—or in its effects on the lungs or the skin, or on the subjacent structures of the body, wholly or in part, immediately or more directly exposed to aërial influence—that is, to its local effects, either partial or general ; and secondarily, to the air's effects on the blood when received into its composition—with respect to its quality of purity or vitiation, its temperature and quantity. The second cause is the effects induced by the quality and constitution of the blood, in relation to those elements entering into its composition, solid, fluid, or aërial, alimentary or otherwise, derived from the stomach, bowels, skin, or other inlet into the system, as food and beverage ; to which may be added, as occasional causes of disease, poison and physic. Or the derangements may be referred to the blood's composition with reference to its imperfect concoction or to its imperfect purification by the liver and kidneys, or other organ of analogous depurative agency—as the cutaneous or perspiratory, or the lungs so far as engaged in the like office.

94. THE BLOOD—THE SEAT OF DISEASE.—If the foregoing be true, it leads inevitably to the conclusion, that the essential cause or occasion, virtually, of every disease (mental emotions and moral influences alone excepted) consists in, or depends upon, the quantity, quality, or constitution and temperature of the blood ; the blood, that is to say, being in some of these respects abnormal in character, affecting thereby the chemical changes in its composition, and impairing the healthy manifestations of the nutritive and vitalizing functions of organic life. The local effects of the air's abnormal temperature and influence are of the same character, though limited often in the extent of their operation,—subversive, that is to say, of the blood's healthy character and influence. And they act, in common with all other causes of disease, by retarding, or exciting, or in some other way operating to depreciate and derange the normal or primary actions of the capillary vessels, and the functions they fulfil in nutrition, secretion, &c.,—producing, as I shall presently make it appear, torpor of these vessels, with *congestion* or passive ful-

ness of the veins; *irritation* of the capillaries, and their preternatural excitement; or *inflammation*, and extreme excitement of the capillaries; with necessarily a corresponding amount of disturbance of their nutritive and secretive functions. Of these three conditions, as the essence, or essential characteristic, of every disease, I shall presently offer a detailed explanation*.

95. CONDITION OF THE PARTS AFFECTED BY DISEASE.—As a legitimate deduction, and one of vast importance, I assume it to be a fact—that all deranging causes of the normal condition of life, or health as it is called, operate either as sedative agents on the capillary system, inducing, by defect of excitement, torpor of their function, and retarding the blood's motion through these vessels, by which congestive accumulation takes place in the veins †; and, as a consequence of this, if long continued, effusion or serous exudation into the parts surrounding them. Or they operate directly or indirectly as irritants, exciting increased action of the capillaries and the blood's quickened motion in the arteries, as may be observed in fever. Or, lastly, they operate by inducing an extreme degree of irritation or excitement of the capillary arteries, which from its force or concentration is necessarily limited to a part, and results in inflammation,—by which the nutrition of the part becomes altered in character, and pus or matter is formed; or thickening or induration ensues, by the deposition of interstitial matter: or it otherwise operates, to the destruction of the organization of the part thus locally affected, by the absorbent power exceeding the nutritive, as in ulceration; or the death of the part, as in mortification.

96. DERANGEMENT OF THE CAPILLARY CIRCULATION—THE ESSENCE OF EVERY DISEASE.—Health, then, essentially con-

* In speaking of the general capillaries of the system, I beg it to be understood that I shall not limit my meaning, in the application of this word, to those vessels, of uniform calibre and of about $\frac{1}{2000}$ th part of an inch in diameter, intermediate to the arteries and the veins—the vessels of nutrition, secretion, &c., in which, under favourable circumstances, action is found to continue some hours after the apparent death of the animal,—but embrace also in my use of this word, the arterial radicles from which the former arise, and in which, I am of opinion, the contractile and more active power of the capillaries resides.

† After the application of a drop of the wine of opium to the web of a bat's wing, by Mr. Wharton Jones, the capillary veins, as well as the arteries, were found dilated (and therefore congested), and the rhythmical action—contraction and dilatation of the veins—which he discovered to exist in this part, appeared to be suspended.

sists in the due performance of the action of the capillaries, as the sustaining power, not only of the nutrition, but of the excitement of every organ and function of the system. And as disease consists in the derangement of these, the primary actions of life; so all derangements of the capillary vessels, I assume (knowing no other) consist in torpor of these vessels with *congestion* or passive fulness of the veins; in *irritation* of the capillaries with preternatural excitement of the arteries, wholly or in part—occasioning fever in the first instance, and subacute inflammation in the last; or in *inflammation* or extreme excitement of these vessels, with the coincident disorder of their functions in the nutritive and secretive processes which they severally fulfil. These, then, one or other, I assume to be the primordial condition, the essence or attribute of every disease—some of the more highly malignant alone excepted, as Cancer, Lepra, Scrofula, and the like,—such being, in my opinion, connected with that amount or kind of depravity or mal-condition of the blood that operates to subvert or derange the before-mentioned ordinary and more natural effects, whereby these several specific and more highly malignant affections become developed.

97. UNITY OF DISEASE.—All diseases, I am therefore led to believe, are intrinsically or virtually of the blood and vascular system,—mental emotions and moral influences operating, in like manner, immediately or remotely, through the brain and nervous system upon the blood-vessels and their contents (thus, for example, excess of mental excitement, as we all know when in anger, by the throbbing of the temples it occasions, does immediately affect the vessels of the brain, and remotely, by the derangements of the digestive and secretive functions which follow its prolonged continuance, affect the blood also); and that one or other of the conditions mentioned—that is, of torpor of the vessels with *congestion*, or of *irritation* with excitement, which run into each other by insensible gradations—constitutes the disease essentially, in whatever part it may be located. And all the various forms in which disease manifests itself, are but the localization of this—the essential disease, modified in character and effects by the nature of the structure and function of the part in which it is centralized, and the combinations resulting from the derangements which successively ensue in the functions of other organs, as a consequence of the continued derangement of the first affected, and the altered condition of the blood and secretive processes which must necessarily follow.

98. THE TREATMENT OF EVERY DISEASE EMBRACED IN A FEW GENERAL PRINCIPLES.—Now, should what I have just advanced be true, and which the sequel, in explanation of the phenomena of all the principal diseases of the body will, I am of opinion, prove it to be, the treatment of every disease is, of necessity, brought within the confines of a few general principles—definite in kind, though doubtless to be modified in degree, by the constitution of the individual, his age, idiosyncrasy, and the particular circumstances of the case, in relation to its cause, severity, and the like. In thus simplifying the subject, we take a step, a mighty step in advance of the present complicated system of medicine; a step—assuredly, of the utmost importance. And if the treatment of every disease may be thus embraced in a few leading principles, our remedies are necessarily as proportionately reduced in number also; and the subject simplified in all its bearings. But to this I merely refer, as the treatment of disease is, at this moment, foreign to my inquiry, which is now limited to the causes and nature of disease.

99. DISORDER AND DISEASE—THEIR DIFFERENCE.—In pursuance of the subject, I must next observe, that disorder necessarily implies derangement of function, and must therefore bear reference to the duty each organ respectively has to fulfil. Disease, in like manner, has reference to the derangement of the structural endowments of the organ or part affected; although, in common parlance, it is not usually so confined in its meaning, nor shall I so limit its signification in these pages. Thus, indigestion implies functional disturbance or disorder of the stomach; whereas inflammation of the stomach, ulceration, or the like, means structural derangement or disease of the organ; but as this must necessarily occasion, and be associated with, disorder of function—and which alone, was probably the primary element of the affection, progressively developing inflammation, &c., it cannot therefore, like the former word, be so limited in its signification—at least, it is not usual so to confine it. And again, disorder in like manner often occasions disease, and indeed I may add, is its most frequent cause. Thus, fever, a disorder of the functions, frequently during its progress develops inflammation in some organ, and is therefore usually denominated disease. It is here deserving of notice, as verifying the conclusions to which we have attained, that disorder, of whatever kind, will be found essentially to consist either in torpor, or excitement of function—the efficient causes of congestion and irritation; and

disease in that of inflammation—into which the former progress by insensible gradations. The former, it will be noticed, are limited in their effects, or nearly so, to the secretive and circulatory action of the vascular system; but the latter extends its operation to the nutritive function or structural endowment of the part as well.

100. CONGESTION, IRRITATION, OR INFLAMMATION, THE ESSENCE OF EVERY DISEASE.—I shall now proceed to explain the pathological condition of the parts concerned in, and the character of those all-important affections—*congestion*, *irritation*, and *inflammation*; one or other of which, I trust that I shall soon make it appear, constitutes intrinsically the essence of every disease.

101. CONGESTION—ITS NATURE AND CAUSE.—Congestion, I must first observe, is a condition of passive plethora, or preternatural distention of the veins of the part affected; and must ensue, as a general condition of the veins to a greater or less degree, upon every cause of general debility or defective excitement of the capillaries; and this must of necessity be attended, with a corresponding amount of debility—or depreciation of the heart's function, with reference not only to the reduction of its electrical power derived from the capillary system at large and furnished to the vital organs by the ganglionic system of nerves, but with that also developed in the capillaries of its own structure; upon which it is, as every organ must be, very largely dependent. Congestion must exist also as a local affection, upon the operation of any debilitating cause of local character influencing the circulation of the part. It is necessary here to notice, that the amount of the heart's force or power in health is, we may presume, limited to the fulfilment of its required functions. Its contraction propels the blood through the arteries to the capillaries of all and every part of the body; and its dilatation—enlarging its capacity, as a sucking pump, concurrently with the expansion of the chest—draws the blood back again into it, on its return by the veins; into which—the veins—it is impelled or principally so, by the action of the capillaries which connect the two systems of vessels. The blood, thus distributed to the capillaries, for the maintenance of organic action, and the excitement of all the functions, is thus kept in constant circulation. But should the heart's power be reduced by debility, succeeding necessarily to defect of electro-nervous development and capillary excitement, however induced; or the quantity of blood

generated in the system, or distributed to a part, be in excess of the heart's power freely to circulate it, it necessarily follows, that in the extreme vessels, or those the most remote from the heart's influence, there will the surplus be found, or congestive accumulation take place; and that the veins will be the seat of it, as the arteries have an inherent contractile and vital power, extending to and augmenting in their terminal capillary extremities, which the veins do not possess: congestion in the veins will therefore be the consequence. It may be slight, evanescent, and unimportant, or it may be of marked effect, and productive of effusion or transudation of the serous or aqueous portion of the blood, through the coats of the congested vessels, as in œdema, or dropsy; or the blood itself may be extravasated, as from the vessels of the bowels in passive dysentery; or the vessels from over-distention may become ruptured, as takes place in the lungs, or in the brain in apoplexy; or in the liver in the case of melæna; or otherwise, the distention may give rise to inflammation, or fever, in the way that we shall presently point out. The congestion attendant on local debility may ensue, upon the exhaustion that succeeds excess of excitement in the part, whatever the cause, as we see exemplified in the more general condition of debility which succeeds to inebriety; or it may follow as a consequence of some mechanical obstruction of the veins of the organ or part affected; as when a ligature is tied round a limb, or other means by which the circulation in the part is impeded, but is not arrested; or it may be developed by cold or other debilitating local agency, depreciating capillary action in the part. Thus in exemplification of the latter and that most frequent cause of disease, cold, take the warm, incubating egg from beneath the hen, and expose the embryo to the air, or allow a few drops of cold water to fall on it, capillary action and the heart's motion immediately cease: restore warmth to it, the heart again beats, and the circulation is restored. Enough has now been said to give a pretty clear conception of what is meant by congestion, and how it may be induced; as well as to render it apparent how, as a determining cause of local congestion, debility congenital or acquired, in any organ or part, predisposes to its frequent recurrence. And thus, some persons are said to be subject to determination of blood to the head, or congestion of the brain; and others again to inflammation of the bowels, chest, or other part—which succeeds as a consequence to congestion of the part.

102. INFLAMMATION—ITS CHARACTER, CAUSES, AND RESULTS. —Such being congestion, what is inflammation? This, in opposition to the passive affection of the veins pointed out, is one of active excitement of the arteries, and is thus induced. Congestion in the veins is, in this case also, the primary link in the chain of effects. It is, at least, very generally so, though it is obvious, the agency of a stimulus may more directly induce it in some cases. Congestion, then taking place in certain conditions of the blood, as to quality and quantity, favourable to the development of excitement; the blood being vitiated and more inflammable, rendered so probably by too rich a diet, or by the arrest of some important secretion, may be mentioned in illustration of quality; and of quantity may be mentioned—there being no effusion or an insufficiency of it, for the relief of the distended vessels—as we see exemplified when the blood in a part is impeded in its return to the heart by ligature or other obstruction, the part below not only becomes swollen, but inflamed also: which is thus brought about: the free ingress of the blood into the distended veins from the capillary or terminal arteries, being thus impeded, the blood in its egress from the arteries becomes impeded also—whence the latter of necessity become in due time distended likewise. From this cause, and in consequence of those chemical changes in the blood, developing heat and motion (which are gradual and accumulative in their nature) now taking place in the blood thus retarded in its course and unduly retained in the arteries, which should have taken place at a more advanced stage of its circulation (in the capillaries and veins—that is to say), the arteries in their terminal capillary branches are excited into exalted action or inflammation as it is called*. Hence, the augmented sensibility, the heat, throbbing, and swelling of a part inflamed, whatever that part may be; and which every person, who has suffered from whitlow, or an inflamed finger, knows too well by experience. The greatest amount of exalted action compatible with the vitality of the part, we assume to be inflammation; beyond this, mortification from exhausted vitality follows; or intermediately, a series of changes

* Mr. Travers, in his work on the 'Physiology of Inflammation,' observes,—"The first effect of a drop of stimulant fluid, or a wound, or other irritant on the transparent web of a frog's foot, is seen under the microscope to arrest the circulation in the part,—the vessels are dilated, and in proportion their fulness is increased, and the colour heightened; but surrounding this stagnant centre, increased activity of the circulation prevails,"—from causes which the above explains.

in the secretive and nutritive functions of the part take place, destructive to its organization; as softening of the structure if it be in the substance of the brain; or the formation of pus or the matter of an abscess; and of ulceration in other parts; the deposition of interstitial matter, or hardening in some cases; or finally, the effusion of serum, or the transudation from the vessels of the serous parts of the blood which results from exhausted power—as in some cases of dropsy; in the effusion into the ventricles of the brain in coma; and in other cases, the same cause occasions exudation into the bowels and diarrhœa, or from the skin when cold-sweat ensues.

103. IRRITATION—AN AFFECTION OF THE VASCULAR SYSTEM.—But there exists a condition intermediate to that of the exalted action of the arteries in inflammation, and the passive one of congestion of the veins, which may be well termed *irritation*, and which, when general, constitutes the condition of fever; but when partial, or limited in the extent of its operation, develops the condition of sub-acute inflammation; or it occasions spasm, or the augmented sensibility of pain or Neuralgia, in parts of greater nervous endowment;—all conditions of excitement, but modified in character by the function or structure of the part affected. This condition, then, of *irritation*, is dependent on the same causes, and pathological condition of the vessels—viz. the congestion of blood in the veins, and the excitement of the capillary arteries as a consequence thereof, but not in an equal or so intense a degree—as in inflammation. Partial effusion from the veins in some cases; increased secretion from the liver, or from the bowels in diarrhœa, or from the skin by sweat in others; or the condition of the blood being less favourable to the development of more active excitement; or a less amount of cause, or its influence being diffused over a greater extent of surface, is here, one or other, the determining cause of difference.

104. EFFECTS ENSUING, DEPENDENT ON QUANTITY OF AGENCY EMPLOYED.—With reference to this subject, I may here briefly add, that secretion is increased by a certain amount of stimulation of the organ, but is arrested by the more active condition of its excitement, as in inflammation. Hence also it is, that cold, in moderation, stimulates and excites the system by the amount of reaction which succeeds that small amount of congestion to which it gives occasion,—and hence the glow which succeeds the cold bath. But in excess, cold arrests capillary action, paralyses the functions, and death ensues; or in an intermediate degree,

it produces that congestive accumulation of blood in the veins, with arrest of the secretions, that develops fever or inflammation. Thus also it is, that the employment of an organ within due bounds augments its vital condition, and develops its nutrition and power; and thus do the arms of the smith, and legs of the porter, increase in volume, and the man in strength. And thus also it is, that the exercise of a man's intellect, within certain limits, strengthens his mind and augments his capacity. Exceed this limit, and congestive irritation of the brain ensues, with excited intellect, and perverted sensation; or spasm or insanity follow; and eventually, inflammation of the brain, with its consequences, the softening of its substance; or effusion and palsy take place.

105. NERVOUS DISEASES—DEPENDENT ON VASCULAR DERANGEMENT.—Enough, I am of opinion, has now been said, to render the subject fully understood, and make good my assumption, that *irritation* consists in a peculiar condition of the blood-vessels of the part affected; and is not, in its essential character, an affection of the nervous system, as it is so generally considered to be, though as a secondary affection, as I have explained, it may be readily so induced; that this peculiar condition of the capillary blood-vessels consists in a state intermediate to that of congestion and the more active condition of excitement attending inflammation; and that one or other of these three affections or conditions of the blood-vessels—that is, of *congestion*, *irritation*, or *inflammation*, locally situated, or existing generally, constitutes the pathological condition or essence of every disease. And as such, we conclude, that nervous diseases, in their essential characters, are in all cases secondary affections, subordinate, that is to say, to some derangement of the vascular system; and as a correlative, we assume that all agents, moral influences and the like not excepted, operate immediately or remotely on the blood and its containing vessels, producing the consequences before named.

106. PRACTICAL CONCLUSIONS.—In conclusion, I would therefore say, that every disease may be classed, under one of the following heads; of *Torpor with Congestion*; of *Irritation with Excitement*; or of *Inflammation with extreme Excitement*; which three abnormal conditions of the vascular system, partial or general, I maintain, constitute the pathological condition, the essence or attribute of every disease; and consequently are, or should be, with their causes, the immediate remedial objects of

treatment in all cases; as the following cases of fever submitted in illustration will testify.

107. INTERMITTENT FEVER—HOW DEVELOPED—ITS CAUSE AND PHENOMENA.—The views above propounded admit of striking exemplification in an attack of intermittent fever—which in its varied phenomena embodies a disease implicating more or less all the organs. To render this intelligible I shall adduce a case in illustration. A person in health travels through a marshy district, he inspires the paludial or malarious exhalation of the marsh—with this his blood becomes contaminated, and he is attacked with intermittent fever or ague. He first feels a sense of malaise; he is languid and oppressed; indicating torpor and general depression of the functions of life. The cause is obvious; his blood, the source of all power, is deteriorated; less heat and excitement are imparted to the system, and the feelings of cold and weakness are experienced. Every organ is implicated: the heart and circulating powers are debilitated, and in consequence are not equal to the keeping of the blood in free circulation; congestive accumulation in the veins accordingly progressively takes place, and more particularly in those parts of the system in which the circulating powers are most feeble, which, for reasons elsewhere explained, I have shown to be in the portal system, or that of the liver and spleen in particular; and hence the sense of fulness and oppression now experienced in those parts, followed not unfrequently with sickness and oppression of stomach, from the implication of this organ also, and its consequences, indigestion. As the congestion increases, and withdraws a corresponding quantity of blood from the general current in circulation, the pulse becomes progressively small and feeble; and as the sense of cold increases, and extends to the muscular fibre, it often occasions a severe and long-continued shivering. This terminates the stage of congestion, and the feeling of cold is now gradually succeeded by the opposite condition of extreme heat, which is to be thus explained:—the congestive accumulation in the veins withdraws a corresponding amount of blood from circulation through the lungs; and as absorption from the lungs, proved by Magendie's experiment, takes place in an inverse proportion to the distension of their blood-vessels, a proportionally greater quantity of air—of oxygen—is absorbed, and the combustible chemical qualities of the blood become as proportionally increased: and as the congestion in the veins at the same time retards the blood in its passage from

the arteries, which communicate by their capillary extremities with those of the veins,—the arterial vessels become therefore distended. When, in consequence of this distention and of those chemical changes which take place in the composition of the blood, becoming effected in these vessels, which sort usually takes place at a more advanced stage of its circulation—in the capillaries and veins,—the arteries become excited into preternaturally increased action, and especially so in their more excitable capillary terminations—and the condition of *irritation* as a consequence ensues; and as this is general throughout the system—febrile excitement, characterized by increased heat of skin and accelerated pulse—the ordinary symptoms of fever is the result.

Thus is fever developed; and a beautiful contrivance it assuredly is for the removal of the obstruction in the veins; and as this is accomplished, excitement of the arteries diminishes, and secretion, which till now was arrested, is restored, and perspiration abundantly ensues—to the restoration of the equilibrium of the circulation, and to the relief of the patient from all his unpleasant symptoms. The cause, however, in this case of intermittent fever, namely—the blood's deteriorated condition, still existing, the congestive accumulation progressively recurs, as in the first instance—and in like manner is succeeded by the excitement of fever, and terminates as before by perspiration. Such attacks, commensurately with the amount of the cause and other circumstances, recur every second, third, or fourth day; the intervals becoming progressively longer, or the attacks shorter, as the patient gets better. Otherwise, the attacks become more frequent, and the intermissions less perfect; the excitement of the arteries, in this case, developing inflammation or extreme excitement (a destructive process) in the organ in which congestive accumulation is most considerable, or predisposition of parts or susceptibility of structure may have rendered most amenable to its influence. And thus will the man, whose stomach has been weakened or digestive organs disordered by intemperate habits, probably have inflammation of the stomach or bowels or liver; and he whose mind has been too actively employed, or who is subject to determination of blood to the head, have inflammation of the brain or rather of its membranes, and thus will brain fever be developed:—a condition of *irritation*, or inflammation of the membranes, which often extends by continuity to the brain's substance, and hence the mind's delusive manifestations, its delirious wanderings, or more excited

condition during the period of exacerbation ;—in contradistinction to *insanity*, which is an affection of a similar character, but more especially of the brain's substance—developed by excess of its employment—a local affection, and without fever.

108. CONTINUED FEVER ; HOW DEVELOPED.—In the above instance are exemplified the three conditions of the vascular system mentioned, running into each other by insensible gradations, and terminating when unchecked the life of the patient ; this being the sequel of unsubdued inflammation—which, as I before said, is a destructive process. Had the debilitating cause upon the capillary vessels been of a local character, or local as to its effects in producing congestion, so would the *irritation* or *inflammation* have been partial or local also. This is well exemplified in the operation of another and more frequent cause of fever—namely, cold ; if partially applied—to the eye for instance,—the eye becomes first congested, then irritated, or inflamed. Ear-ache, sore-throat, cough, rheumatism, and a multitude of affections, are thus, as experience testifies, induced by cold partially applied. But its more extended influence on the system is to produce fever, which may be thus explained. Cold first operates on the skin, in torpifying or arresting its secretive function of perspiration—the temperature of the surface being reduced below the point necessary to maintain the chemical changes in the blood, with the action of the capillary vessels and secretion that ensues. These vessels accordingly become congested, and the excitement of *irritation* is induced by the obstruction : this may be trivial in amount, commensurate with the extent of the cause, producing a little febrile heat of surface alone ; or it may be more considerable, the perspiratory secretion being completely arrested ; or the cold's influence may have been extended to the subjacent parts, and then a greater amount of fever will be induced. And this fever will necessarily be without intermission, the cause continuing to operate till the secretive function of the skin, which is impaired, is restored. It is obvious also, that the febrile cause may involve and implicate the lungs, pleura, air-passages, or other organ, and thus develope *irritation*, or *inflammation* in these parts likewise. The difference between these two conditions of *irritation* and *inflammation* is only in degree ;—the first being an augmented healthy excitement of the vessels developed with a view of restoring secretion, and removing obstruction ; and the second arresting secretion and perverting the natural endowments of the part. And thus, in inflammation of

the bronchial tubes, the secretion of their mucous membrane is arrested ; but as excitement is reduced and amendment takes place, free expectoration follows. The fever, or condition of *irritative* excitement, is obviously therefore, within due bounds, a curative effort of the system, the operation of laws of our constitution, which have been ordained for our preservation. In furtherance of the same provident intention of Nature, it is my opinion, that the copious perspiration which terminates the attack of intermittent fever, is another manifestation of the same conservative principle, intended to eliminate and expel from the system the malaria or aërial poison with which the blood is contaminated, and which has given rise to the fever. Hence too, the operation of malaria is not, as it is too commonly supposed to be, primarily on the nervous system, but on the vascular ; the blood—the source of nervous power, and the main-spring of life—is deteriorated ; chemical action in its composition is diminished, and the development of heat and electricity is reduced as proportionately. *Irritation*, I maintain therefore, wherever located, is not an affection of the brain or nervous system, primarily, but of the vascular or capillary system ; the nervous system in all such cases being subordinate and secondary in character to the vascular ; although the latter, doubtless, is to be influenced through it.

Having now completed this part of my subject, embracing an explanation of what constitutes the pathological condition or essence of every disease, and how the varied phenomena of congestion, irritation, and inflammation are induced, and illustrated the same in the phenomena of fever, as developed by its most frequent causes, and contamination of the blood, I shall next treat of the blood, in its normal or healthy condition ; and of it in its abnormal, or diseased state.

CHAPTER V.

OF THE BLOOD IN ITS NORMAL OR HEALTHY CONDITION, AND IN THAT ALSO OF ITS ABNORMAL OR DISEASED STATE.—OF THE NATURE AND COMPOSITION OF THE BLOOD, AND OF THE SECRETIONS FORMED OUT OF IT; AND OF THE MUTATIONS IN CONSTANT PROGRESS IN THE SYSTEM.

By a consecutive train of reasoning—from causes to their effects, and contrariwise from effects to their causes, we arrived in our last chapter at the conclusion—that *congestion*, *irritation*, and *inflammation*—one or other of these affections of the vascular system—existing in a greater or less degree, and which run into each other by insensible gradations, constitutes the essence or pathological condition of every disease; the former two being limited in their effects, or nearly so, to the vessels of the blood's circulation; the latter, extending the sphere of its operation to the nutritive and secretive processes also—or structural endowments of the part affected.

In the prosecution of this research, it next becomes us to trace the operation and influence of the numerous remote causes of disease, as they severally operate to derange the functions of the vascular system and various organs of the body, and disorder or impair the normal or healthy condition of the blood; the abnormal condition of which, I pronounced to be the parent, or immediate cause of these three several affections of the vascular system, and which, when located in one or more of the various organs or tissues of the body, constitutes the pathological condition or substance, virtually, of every disease—to which man is liable. The words used on the occasion referred to were, “The essential cause or occasion virtually of every disease (mental emotions and moral influences alone excepted) consists in, or depends upon, the quantity, quality, or constitution and temperature of the blood; the blood, that is to say, being, in one or more of these respects, abnormal in character, affecting thereby the chemical changes in its composition, and impairing the healthy manifestations of the circulatory, secretive, and nutritive functions of organic life.”

With reference to this abnormal condition of the blood, it would appear therefore desirable, that I should, before attempting to trace how the numerous causes of disease operate to impair or disorder the blood, first describe the blood, in relation to its primitive healthy qualities and condition.

To give form and substance to my description, I shall proceed to consider the blood under two points of view—in relation to the purposes it fulfils in the system ; first, in reference to its vitalizing and heat-sustaining qualities ; and secondly, of the blood in relation to the nutrition and growth of the body, and to the secretions which are formed from it, for especial and useful purposes of the system, or otherwise, excretory and malign, and therefore to be expelled.

109. DIFFERENCE BETWEEN ARTERIAL AND VENAL BLOOD.—

With reference to its qualities of the first description—I may observe—that the blood, in its living fluid state, appears, under ordinary vision, a uniformly transparent fluid of variable red colour. In the arteries it is of a bright scarlet colour ; it is in this condition alone (of purity and high endowment) that it is capable of fulfilling during its circulation its vitalizing functions. In the veins, it is of a dark crimson hue—bordering upon black, having, during its previous circulation through the arteries and capillary vessels, parted with its heat-producing and vitalizing qualifications. The difference in the colour of the blood in those two systems of vessels, is referrible to certain changes which progressively take place in its composition during its circulation. The dark crimson or venous blood, in its passage through the lungs, exchanges the carbonic-acid, or gas of combustion, with which it is polluted, for its equivalent or corresponding amount of oxygen, which it derives from the air of the atmosphere (composed of four parts of nitrogen in admixture with one part of oxygen), to which it is exposed in the lungs ; and this exchange of gases is attended with the transition or change in its colour to a bright scarlet. The blood, now of scarlet hue, is circulated by the arteries to the capillaries of the system at large ; and in these vessels more particularly (in which the atomic constituents of the blood are more closely approximated or brought into immediate contact), the oxygen, imbibed from the air in the lungs and circulating as a constituent of the blood, completes its combination with the carbon and hydrogen, or combustible elements of the blood. These elements, derived from the food and beverage it has received into it from the stomach, combining

with the oxygen, form water and carbonic-acid, and give out caloric and electricity—or heat and motive power—in the process ; and as the capillaries, constituting the principal substance of all the organs, are said to be 500 times more voluminous than the arteries—hence the equability of temperature and vitality of every part of the system. From the changes pointed out, and others of a chemical nature that simultaneously take place in the composition of the blood, connected with nutrition and secretion, the blood is again transformed in colour to its primitive dark crimson hue ; in which deteriorated condition it is now received by the veins in connexion with the capillaries, and re-conveyed to the lungs for aërial purification and renovation, as in the first instance.

110. THE UNIFORM HEAT OF THE BLOOD.—The temperature of the blood in health is pretty uniformly 98° ; it is the same at all seasons or nearly so, and in every variety of climate. This uniformity of temperature is maintained by a beautiful adaptation of means to this end—by the ever-changing density of the atmosphere which attends alterations in its temperature. Cold, contracting the volume of, or condensing the air—renders it proportionately richer in oxygen and combustible qualifications ;—whereas heat contrariwise dilutes and attenuates it. By these changes in the volume and density of the atmosphere, the blood is furnished with more or less oxygen in accordance with the external temperature and requirements of the system ; the combustion, and the heat evolved by its agency in the blood, augmenting, in exact proportion with the reduction in temperature of the surrounding atmosphere, and the reduced heat of the body exposed to the air's more cooling influence ; and contrariwise, so is less heat evolved in the system when the surrounding atmosphere is augmented in temperature, and the air is as proportionately attenuated.

And as we have reason to believe, that in proportion to the development of heat in the body, such is also the development of electro-nervous power, here is manifested to us another display of harmony and design, by which motive power is increased in cold climates and seasons, when and where it is more largely required, by the increased demand and appetite for food as fuel that now exists, to maintain the augmented exertion called for to obtain it ; the food being the source whence the carbon and hydrogen of the blood or fuel of the system is obtained, and which is now required in larger quantity to maintain the in-

creased combustion that is necessary to sustain the ordinary temperature of the body, which is essential to those chemical changes being effected in the blood's composition, by which vitality and nutrition are effected. The reverse of this obtains in hot climates, where less fuel is required, and food in general is more readily obtained, and where accordingly the natives are as proportionately indolent and apathetic. In the climate of Europe, we find also the appetite diminished, and the active powers of both body and mind are reduced, as the combustion and development of electro-nervous power is reduced also by the heat of summer; and hence the sense of debility so generally experienced at that season.

I have omitted hitherto to mention another reducing agent of the body's temperature or cooling process, and of no mean importance—that is, the increased exhalation and evaporation from the surface of the body, of perspiration, which attends muscular exertion and heat of season: another striking illustration of conservative wisdom—of harmony and design, to preserve the body at its normal temperature under every circumstance.

111. DIFFERENCE OF TEMPERATURE BETWEEN ARTERIAL AND VENOUS BLOOD.—Having spoken of the general temperature, I must now say something of the specific heat of the blood, or rather of the difference of temperature that exists between the venous and arterial blood; and with this view shall adduce the experiments of Sir Astley Cooper and Mr. Coleman on this subject. Mr. Coleman strangled a cat, and immediately opened its chest while the blood in the left ventricle was still fluid. He then introduced a thermometer through an opening in the pericardium to each side of the heart, and it stood at 98° . In the left ventricle, when the thermometer was introduced, the blood (arterial) was only 97° ; but in the right ventricle the venous blood was nearly 99° . In fifteen minutes, however, instead of the right ventricle possessing 2 degrees of heat more than the left, it was found to have 4 degrees less. Sir Astley Cooper repeated this experiment in various ways, and found invariably, that although the venal blood was superior in temperature at first, before coagulation was complete, the arterial became from 3 to 6 degrees warmer. These facts establish—that the specific heat of arterial exceeds that of venous blood, though the latter absolutely at first is the hotter of the two; and that these chemical heat-producing changes in the blood do not take place in the lungs, but are, from the time of the inhalation of oxygen

in the lungs, progressive and accumulative in the system : which reasoning, *à priori*, would lead us to expect, holding in view the purposes it was the intention of Nature to accomplish, namely, an equable distribution of heat throughout the system—the same on the circumference as in the centre. And thus too, is the blood of the lungs, more particularly exposed by the constant inhalation of cold air to reduction of its temperature, provided for, by the circulation through them of the hotter venous blood ; and so likewise, from the same cause, will the exhalation of carbonic acid, with which the blood is now charged, be favoured by this increase of the blood's temperature ; and contrariwise, so will the blood's absorptive power and capacity for the gases be increased, by the reduction of its temperature, which must follow its prolonged passage through the lungs : and thus is harmony and design manifested to us in all Nature's works.

Having said all that is necessary as regards its heat-producing and vitalizing qualities, I shall now proceed to consider the blood in relation to its nutritive, secretive, and other physical qualities.

112. THE RED VESICLES, OR BLOOD CORPUSCLES.—In the living state, or that in which it is seen by the microscope to circulate in the capillary vessels, the blood appears to consist of a transparent, very slightly yellow-coloured fluid, in which innumerable small vesicular bodies of a disk-like-shape and of red colour are found swimming : these bodies constitute about 12 per cent. of the blood's weight. The fluid part of the blood, called *liquor sanguinis*, is that alone which transudes the coats of the vessels, and, irrigating the surrounding textures, affords nutrition to the various parts through which the blood circulates. The red-coloured vesicular bodies aforesaid, called blood-corpuscles, give colour to the blood, and are supposed to be in a constant state of dissolution and reproduction, but the purposes they fulfil as vesicular bodies are not understood. Were I permitted to offer a conjecture, I should thus reason, and say :—Form is a necessary condition of all matter. In inorganic matter, the form is very generally that of crystal, as we see in the metals, sulphur, and mineral substances generally ; and in exemplification of the tendency of such matters to assume this form at all times, bring a few particles of magnesia, water, and sulphuric acid together—they immediately unite in certain definite proportions, and a crystal of definite shape is formed. To this crystal add a drop of water, and its solution takes place : now add a particle of potass, and this seizes upon and combines with the sulphuric

acid : another crystal of definite but altered form is produced, and magnesia, in the form of a white impalpable powder, is set free ; and thus certain elementary bodies and combinations of matter always assume the same definite form and character. And the same, it is fair to conclude, takes place in organic and vital compounds,—the form corresponding with the proportions and character of the compound. In this case, it is not crystalline, but vesicular, or cell-form ;—and thus in the blood, the required elements meeting, red corpuscles are formed, and in like manner, in the lymphatic and chyloferous vessels are the vesicles they contain, and pour into the blood, produced. And so it is with the secretions and various organic productions in which cells are formed ; it is not the cell that forms the secretion, but the aggregation of the proper elements of the secretion that forms the cell. Thus reasoning, I would attach no importance to the blood-corpuscle beyond its elementary constitution, which, in its formation, may thus divest the blood of those elements of its composition not immediately necessary to the constitution of the remaining blood-fluid ; which, as I before said, alone permeates the vessels, and nourishes the surrounding tissues. Or otherwise, it may be thus reserved for especial purposes of the organization, as in the endowment of the brain or the secretion of semen, and be thus rendered available for these or other purposes of which we know nothing. Or finally, its dissolution, at an after period, may alter or impart other important properties to the blood-fluid. Its form too, may be of use—thus mechanically operating by its attrition against the sides of the small vessels, to keep them free from deposit, and permeable at all times. And it possibly inherits, as an organized body, a vital existence, or has an amount of vitality attached to it, which the plasma, or fluid part of the blood, does not possess, till thus organized in the structures to which it gives nutrition. Hence it is found, as I have it on the authority of Mr. Tod, who has devoted much attention to the subject, and whose researches have been long since published in the ‘Lancet,’ that in the incubation of the egg, so soon as the albumen, or embryotic plasma, becomes coloured, by the agency of the air and the heat of incubation to which it has been exposed, and vesicles have been formed, vital motion is to be discovered in the fluid ; and this takes place before, as might be expected, any vessels are to be recognized, of which the vesicles or cells are considered to form the basis.

113. COMPOSITION AND PROPERTIES OF THE BLOOD.—To deter-

mine what are the constituents and physical properties of the blood, we must open a vein, when it will be found that the blood received into a tumbler or other vessel, is denser than water—its specific gravity or weight in ordinary being 1050 to water at 1000, but varying in this respect from age, sex, and disease, according to its richness or purity. In a few minutes after it has left the vein as it loses its vitality it commences to coagulate; and as this process advances, it separates into two distinct parts—a fluid part called serum, and a solid clot called crassamentum.

The serum consists of a slightly yellow alkaline solution of albumen in water, in which some common salt and other saline substances are dissolved, and some oily particles are suspended. The crassamentum is composed of albumen, fibrine, and hæmatin; the latter, consisting partly of oxide of iron—is the constituent which imparts red colour to the blood. One thousand parts by weight of blood contain about 790 of water, 194 of albumen, with about $2\frac{1}{2}$ of fibrine, $2\frac{1}{4}$ of hæmatin, and about 11 of saline and gaseous matters.

The principal constituent of the blood, apart from water, is obviously therefore albumen—or the substance of white of egg. And, as the composition of this substance, as well as that of fibrine (which in the living state of the blood is held in solution and admixture with the albumen, and differs from it only in the relative proportions of its elements)—is, carbon, hydrogen, and oxygen, with the addition of about 16 per cent. of nitrogen—the especial animalizing principle; and as nitrogen has the property of giving permanence to its compounds, by rendering them much less amenable to oxidation, the organization, composed of this albuminous compound, is thus preserved from decomposition and combustion; so says Liebig. Now, as the three first—carbon, hydrogen, and oxygen—are the elementary constituents of starch, sugar, oil, and gum (the only really essential constituents of all vegetable dietary substances), their source may very properly be assumed as derived from the bread, potatoes, and other vegetable food received into the stomach. But with respect to the fourth—the animalizing principle—nitrogen; this, I should say, was derived by respiration from the atmosphere, of which it constitutes four-fifths of its weight. The nitrogen, imbibed in the lungs and received into the blood, being thus admitted into combination with the nutritive juices derived from the vegetable food absorbed from the stomach and bowels, during the course of their circulation with the blood—thus combine, and form albu-

men. Hence, the venous blood is found to contain a less proportion of nitrogen gas than arterial,—the nitrogen having, during the course of its circulation, combined with the elements of the blood before named. In like manner, as oxygen combines during its circulation with the carbon of the blood, and forms carbonic acid, with which the venous blood is accordingly found to be loaded.

These views are substantiated by the fact, that venous blood contains less free nitrogen than arterial blood, and venous more carbonic acid than arterial. Dr. Clanny gives the following as the results of three series of experiments, made in each case upon 10 ounces of blood, with the view of determining the amount and character of the gases contained in blood.

	Arterial.		Venous.	
contains	{ Oxygen056025	} cubic inch.
	{ Carbonic acid023056	
	{ Nitrogen	1.843613	

The above we must consider in the light only of an approximation to the truth—as the quantity of nitrogen gas absorbed, or rather entering into combination with the other elements of the blood, must necessarily bear reference to the character of the diet of the individual experimented upon, and other circumstances; whether the diet was of animal substance, and contained therefore its due proportion of nitrogen; or otherwise of vegetable substance, and thus entering into combination with it. Hence Dr. Edwards found—in his experiments on birds, that in the summer months, when their food was principally of insects, they appeared to absorb but little nitrogen—much less than they did under other circumstances, when their food was of a vegetable description. The estimate given by Sir Humphry Davy, as the result of his numerous experiments on respiration, is, that the absorption of nitrogen by man under ordinary circumstances, is equal to five cubic inches of the gas per minute; which amounts by weight to $4\frac{1}{2}$ ounces troy per diem—a quantity equal to all the necessities of the case.

I never pin my faith to the sleeve of any man, as to do this is to stop all progress, feeling as free to exercise my opinion as I would that others should exercise theirs; but taking Nature for my guide, under her promptings after duly informing myself on the subject, I deduce my own conclusions. In conformity with which, without having to seek for it in holes and corners, and in

infinitesimal quantities, the source of the nitrogen of albumen I consider to be principally that of the atmosphere, knowing no other purpose for which it can be inspired by animals, or reason why it should otherwise exist. I am free to admit, that potatoes may contain as much as 2 per cent. of albumen, and wheat and other grain a much larger quantity of this or other nitrogenized product—but it does not therefore follow that animals should be exclusively indebted to this source for their supply of nitrogen, at a time when this element of the blood's composition is so immediately available, and so abundantly furnished to the animal by respiration; and if,—to be thence derived and combined by the vegetable organism, why not so by the animal, of which it forms the characteristic element?

Albumen then may very properly be regarded in the light of the primitive animal formation; as starch, the basis of sugar, gum, &c., is that of vegetable bodies; seeing that an egg, submitted to incubation, consisting almost exclusively of this substance, under the heat present, and the elements of the atmosphere permeating the shell and entering into combination with it, not only form fibrine and hæmatin—the two other proximate principles of the blood, but all the varied constituents of the bird's substance and structure. The yolk is composed also of albumen, in combination with oil and sulphur; and the shell is composed of phosphate of lime—the earth of bones. The bird is, however, known to be formed principally of the albumen or white—the yolk being reserved as the food rather of the chick at the ulterior stage of its growth, when a greater amount of heat and vitality is required for its liberation from the shell; though it may, and probably does, yield certain of its elements to the chick at an earlier period of its development.

In addition to the carbon, hydrogen, oxygen, and nitrogen, the principal elements of albumen, and the other proximate principles of the blood, there are, however, certain mineral and saline substances entering into its composition, and of the animal structures generally. Thus when blood or flesh is burnt, the ash is found to consist of phosphoric acid, the alkalis—potash and soda, the earths lime and magnesia, oxide of iron, and chloride of sodium or common salt. The sulphur, carbon, and other volatile elements have been in combination with oxygen or otherwise dissipated by the heat. As these saline and earthy matters are found in the blood of all animals, at all times and under all circumstances, they are regarded accordingly as essential con-

stituents of the blood, and of animal organization—into which most of them are constituents, in certain definite proportions. Now, as all these substances are to be found also in the ash of vegetable bodies, the source from which animals derive them, as constituents of their blood, is therefore sufficiently obvious,—a fact, however, which leads the mind to doubt whether these substances are not adventitious rather than essential, or at least in some degree so, seeing they are thus unavoidably derived. Liebig says, that “turnips, potatoes, and the herbs eaten by herbivorous animals, contain the same incombustible constituents as the blood of these animals, and very nearly in the same relative proportions. The carnivorous animal contains in its blood the constituents of the ash of flesh. The incombustible elements of the blood of man are the constituents of the ashes of bread, flesh, and vegetables.”

The next point to be considered is, that the blood of all animals is invariably of an alkaline character—arising, as Liebig says, “from the presence of one of the fixed alkalis in a free state. All the articles of food capable of sustaining sanguification and nutrition contain carbonic acid, or phosphoric acid, with the alkalis soda and potass:—the two latter in such proportions, that if we suppose them dissolved, the alkali invariably predominates. The free alkali gives to the blood a number of very remarkable properties. By its means, the chief constituents of the blood—the albumen and the fibrine—are kept in the fluid state. The free alkali acts also as a resistance to many causes which in the absence of the alkali would coagulate the albumen; and on the alkali depends a remarkable property of the blood—that of dissolving the oxides of iron which give colour to the blood. And again—to certain of the elements of the blood—the alkali imparts a greater capacity for combustion or oxidation than they would otherwise possess.”

In opposition to this alkaline and fluid state of the blood, the muscular and other organized tissues of the system, though formed from the blood, are characterized by the opposite condition, or that in which there exists as constituents of these solids—a predominance of phosphoric acid—so says Liebig. How, will it be asked, is this to be explained? This is a process of a more refined chemistry, and admits of the following explanation. The chemistry of the blood's formation, and of the development of caloric and electricity, takes place, or principally so, within the vessels of its circulation: that of the formation of the mus-

cular system and other structures, as well as of some of the secretions, takes place exterior to these vessels. The blood then, or rather the nearly colourless alkaline *liquor sanguinis* or fluid of the blood, for that alone transudes the coats of the capillary vessels, and permeates the tissues of the surrounding structures—on this being effused, the alkaline phosphates of the blood-fluid become decomposed, by the agency of the electricity set free in the capillary vessels, but now existing, probably in a more intense form in, or abundantly supplied by, the ganglionic nerves of the organized structures. The alkaline phosphatic fluid being thus decomposed, the phosphoric acid, one of the elements of its composition, combines with and consolidates the fibrine of the muscular tissue, or other albuminous product in process of formation,—while the alkali, with the remaining portion of the blood-fluid, in combination with the products of the worn-out tissues of the part, is restored to the general circulation, by the agency of the absorbent vessels, which are found to pervade every part of the system, and pour their contents into the veins.

The exemplification here noticed would appear to bear reference more particularly to the formation of the muscular tissues; but I must to this add, that all the other structures are nourished in like manner; each having its own specific predilection of affinity, and power of appropriating the elements of its composition from the aggregate compound of all the structures contained in the blood-fluid;—whether it be the gelatine—as the foundation of the bony structure; or the phosphate of lime—its earthy constituent;—the vital chemistry and structural endowments of the part, decomposing some, and forming new chemical combinations out of the elementary substances at hand, or not, as each structure may require; and the residuary and useless matters of the blood going principally to form the secretions, or rather excretions—such, that is to say, which are to be expelled from the system, as urine, bile, &c. Some of the secretions no doubt are formed within the blood-vessels, by the aggregation of their elementary constituents, and are simply strained off from the blood, or separated by the agency of the excretive organ; such would be the case with the urine—and thus is urea and its compounds found to exist in the blood of gouty and other persons whose kidneys imperfectly fulfil their functions in eliminating these matters. And so in like manner are the constituents of bile found to abound in the blood of those whose liver is torpid and deranged—the bile-cell of this secretion being formed by the

aggregation of its elements when strained off in the ducts of this organ; in the same way as the lymph and blood-corpuscles before noticed are formed of their respective compounds.

The secretion of semen and the other more important secretions, we may presume are formed in a similar way exterior to the blood-vessels, by the aggregation of their elements separated by the vital chemistry of the part, in the secretive ducts of the organ.

The composition of the blood, as I have now explained, with the addition of water, which constitutes no less than four-fifths of its weight, and which contains when received into the system at all times in solution a very notable quantity of lime, is thus furnished by the food and beverage man takes (water being man's only essential beverage), with all its constituent elements, excepting those of an ærial description, which, during the blood's passage through the lungs more particularly (seeing that air is absorbed also from the skin and bowels), it obtains from the atmosphere. These—as oxygen and nitrogen gases—are imbibed; and circulating in admixture with the blood, progressively combine chemically with the elements of its composition;—the oxygen more particularly uniting with the carbonaceous and hydrogenous elements—evolving caloric and electricity in the process, and the nitrogen with others, producing the plastic constituents of the blood albumen and fibrine.

Of the source and character of the secretions, I shall now enter a little more into detail. In the production of the animal structures, as well as in the formation of the proximate principles of the blood—albumen, fibrine, and hæmatin—there are but certain of the elements of the food required, and in different proportions to those in which they exist as constituents of vegetable or other dietary substances partaken of by man. The residuary elements of these substances contained in the blood, in common with those, combusted or otherwise, which are left after the transformation of the albuminous plastic fluid of the blood into the various tissues of the body, conjoined with those derived from the worn-out structures received into the veins from the absorbent vessels,—variously combine. These effete and residuary elements—which must exist in variable quantities and proportions—dependent upon the age, sex, and excretions of the individual, the character of the diet and beverage made use of, the amount of respiration, and a multitude of ever-varying circumstances—combine, in certain definite proportions, in obedience

to well-known laws of chemical affinity, and are productive of a variety of compounds—constituting urea and uric acid of the urine; and also of hippuric acid, of taurine and cholalic acid—or the principles of bile; of lactic acid, or the principle of the perspirable secretion, &c. which severally excite the kidneys, the liver, the perspiratory glands, the mucous membrane of the bowels, and other excretive organs, to eliminate and remove from the blood; in like manner as a little jalap, aloes, or senna will, when admitted into the blood, excite the bowels to purgation, or ipecacuanha occasion vomiting, &c.; and hence the necessity and function of those organs, and the character of the secretions—urine, bile, perspiration, and the other excretive fluids produced; as well as that of semen in the male, and the catamenia in the female, which, in like manner, excite the appropriate organs to their expulsion.

In addition to the excretions named, there are other secretions, fulfilling especial functions or purposes in the system—as the saliva, the gastric juice, and pancreatic fluid, which we have reason to believe are products especially constituted from the blood by each gland respectively concerned in producing them. In addition to the solid and fluid impurities of the blood thus eliminated, there are others also of a gaseous or aërial nature: carbonic acid, a product of the oxidation of the carbonaceous elements of the blood, is of this description. This is exhaled from the lungs and skin, of which I shall speak more particularly hereafter. Water, too, is also formed in the system, by the combustion of the hydrogen of fat, sugar, and other constituents of our food; this and other volatile matters pass off by exhalation also and evaporation from the above-named surfaces.

If I add to this, the purposes which are severally fulfilled by the especial secretions before alluded to—saliva, gastric juice, &c., which, with one exception, are all employed in the purposes of digestion and assimilation, or in other words, in dissolving, reducing, and combining the multitudinous and ever-varying materials received into the stomach, as the food and beverage of man, or rendering them in a fit state to be received into the vital stream,—I shall leave nothing further of importance to be said on the blood's formation and constitution. *First*—the saliva, or secretion of the salivary glands—with which, and atmospheric air, the food is mixed in the mouth: experiments lead us to believe that it imparts qualities to the farinaceous compounds, by which, acting as it were a ferment, the starch, or principal

constituent of vegetable food, is transformed into a saccharine compound. *Secondly*, the gastric juice, or secretion of the mucous membrane of the stomach, is of an acid character, and acts as a solvent of the muscular and other fibrinous solids of our food, and thus renders them fit for absorption. *Thirdly*, the pancreatic fluid, or secretion of the pancreas, there is reason to believe, has an especial influence on all fatty substances, by which they also are reduced to a fit state for absorption. And *lastly*, the bile, an alkaline fluid, combines with and neutralizes any acid which may be present in the alimentary compound; and this secretion, in conjunction with all those previously named, adds not only fluidity to the compound, but as electrical products, vital qualifications to it also, which we may suppose to be essential, before this new and raw material is received into the blood:—which, it will be especially observed, it now is, through the instrumentality, or principally so, of the veins of the bowels—along which it passes for absorption. And as all these veins terminate in the liver, the blood, in its passage through this secretive organ loaded with the alimentary juices, is here expurgated, with the bile now secreted, from any prejudicial matters it may have imbibed from the stomach and bowels, and the whole is more highly vitalized and endowed, by passing through this secreting organ, before it obtains a passage into the general current of the circulation.

In fine, it will be now perceived, that the sum of the organic processes is to produce animal substance, and impart to it heat and motion—to nourish and form the body, that is to say, and sustain its vitality: both of which results, as the fruit of all the processes of the organization, are accomplished out of, and by the agency of the blood:—and all these processes again are centred in, and are indispensable to, the blood's formation and perfection; that is, to the acquisition and reception of the materials into the system, and their conversion into healthy blood:—that verily, the blood may be regarded in the light of, and really is, the *Alpha* and *Omega* of animal existence. And if so, to maintain it in its normal condition of purity and perfection, and in quantity sufficient to the necessities of the system, but not in excess,—if not the only, are the principal conditions, without doubt, requisite to the sustentation of health.

Wherefore we assume—although we have arrived at this conclusion by a different train of reasoning to that which led us to the same deduction at an earlier period of our inquiry, that all

the deranging causes of health operate, directly or indirectly, in subverting this, the blood's normal condition ; or in other words, impairing or altering in some way, the blood's healthy constitution or condition : or otherwise, from the excess or deficiency of its quantity, similar results or derangements of health ensue.

The source of the materials and composition of the blood has now been adequately described for all our purposes, as well as its renovation and purification ; and the nutrition of the system has been also cursorily glanced at. It now remains for me, having already described the structure and function of each organ as it is respectively concerned in maintaining the purity of the blood, and sustaining health, to show how the several causes of disorder and disease do, as I have stated, operate, to impair the blood's qualities, and derange the ordinary manifestations of health ; or, in other words, pervert the normal condition of life and produce disease. The operation of these causes, in the disorder of the blood they give rise to, and the disease which becomes manifested by their agencies, might conveniently be all classed under two heads, although in all cases they must of necessity be, to a certain extent, united—though not in a degree whereby this is sensibly manifested. Under the first head, and most frequent forms of disorder of the blood, will be those more exclusively confined in their operation to the vessels in which it circulates,—retarding or increasing, or otherwise deranging those chemical changes in constant operation in the blood, whereby caloric and electricity are evolved, or heat and motive power are maintained—by which derangement, from defect of excitement on the one hand, torpor of the capillaries and congestion of the veins take place ; or on the other, increased development of heat and capillary action, and fever if the cause be a general one, ensues ; or if the cause be partial, or limited in degree of its operation, subacute inflammation ; or if the structure more particularly affected be nervous, nervous excitement, with the augmented sensibility of pain or spasm in the part, takes place ; or if in a glandular organ, arrested or disordered secretion ; or if the cause be greater in degree, inflammation and its consequences—abscess, ulceration, and mortification—follow, as I have, in a former chapter, more particularly pointed out.

Under the second head, might be comprehended all those diseases of the blood, implicating more particularly the nutritive function of the capillaries, developing in such cases of the blood's disorder, abnormal structures and vitiated secretive products ;

affecting in one case the glandular organs more particularly ; in another, the skin ; in a third, the cellular and adipose tissues ; in a fourth, the osseous ; and so in like manner may all the structures of the system be affected by abnormal conditions of the blood—seeing they are all formed out of, and indeed by the blood.

And thus the number and variety of skin-diseases,—of those also affecting the absorbent glands—called scrofula,—of that affecting the mammary and other glands—called cancer,—of the subcutaneous tissues also in lepra,—of the cellular and adipose tissues in sarcoma, fungus-hæmatodes, &c. &c., all of which diseases, emanating in disorders of the blood, implicate the nutritive function of the part, under circumstances, and in a way, of which we may at present know little, but may conjecture much, by reasoning upon what we are already acquainted with. Thus, in illustration and exemplification of what we really do mean by the blood's disorder and the disease it gives rise to, without limiting ourselves at this time to either of the heads under which all may be classed, we may mention the fact of urea and its compounds, which we have reason to believe are products formed in the blood of the surplus nitrogenized elements of the food and worn-out tissues of the system,—that if these are not duly eliminated and separated from the blood by the kidneys,—the ligamentous and fibrous structures of the body are more particularly affected by their presence in the circulation, and pains in those parts, and the symptoms of gout or rheumatism are developed, and depositions of the lithate of soda in these structures not unfrequently take place, producing the nodes called chalk-stones. And again, if the blood is not divested of the cholalic acid and other biliary elements which it is the office of the liver to separate, the countenance becomes sallow, and the mind desponding, by their presence in the blood,—while the bowels are torpid from defect of biliary excitement, and a host of dyspeptic and anomalous symptoms ensue. Or if by the torpor induced by cold on the skin, the perspirable excretion of lactic acid or its elements are retained in the blood, the mucous membrane of the bowels may become irritated by their presence, and diarrhœa ensue ; or the mucous membrane of the lungs or air-passages may be so affected, when bronchial affection with cough and sore-throat and fever become developed. Or the blood may, in like manner, become polluted by the inhalation of malaria, or other cause from without the system, and inter-

mittent fever supervene; or if impregnated by inoculation with the matter of vaccine, or that of the small-pox virus—these especial eruptive fevers will ensue. And lastly, the blood may be impregnated through the medium of the stomach and bowels, as exemplified in giving strychnine, opium, or prussic acid,—when from the first, active nervous excitement and spasm will ensue; or from the latter, if the dose be large, death by deprivation of power and paralysis of all the functions.

With the above observations on the disorders of the blood, and the character of the diseases they give rise to, I shall, in the next chapter, proceed to point out the general principles to be pursued in the treatment of disease, and of the divisibility of disease into two kinds—acute and chronic, and of the division also of the causes into two classes—predisposing and exciting,—preparatory to showing how the principal causes of disease severally operate to impair the qualities of the blood and derange its circulation, and thus produce the numerous diseases to which man is amenable, and the symptoms by which they are recognized.

CHAPTER VI.

OF THE GENERAL PRINCIPLES, OR INDICATIONS TO BE PURSUED IN THE TREATMENT OF DISEASE, AS DIVISIBLE INTO TWO KINDS—ACUTE AND CHRONIC; AND OF THEIR CAUSES, AS DIVISIBLE ALSO INTO TWO CLASSES—PREDISPOSING AND EXCITING.

114. GENERAL CURATIVE INDICATIONS.—Seeing that the blood is the parent of all power—the sustaining element of life and health; and its vitiation or disorder—*fons et origo mali*—the efficient and determining cause of every disease, of which the essential characteristic is either congestion, irritation, or inflammation,—in whatever organ or part located; with the exception of those few cases of disease, which may have been developed or brought into operation by the agency of some special irritant or mechanical cause—as compression, injury, fire,

and the like,—the curative indication of every disease necessarily consists in the purification of the blood and its restoration to its primitive healthy condition ;—with the removal of the effects arising from its abnormal and diseased state—namely, of congestion, irritation, or inflammation—whichever may have become developed by its agency ; at the same time that especial attention is directed to the remote or immediate exciting cause of the disease,—to the removal of which, so far as it may be practicable, should it still continue to be in operation, our earliest attention should accordingly be directed. These, in fine, are the sum of the indications to be fulfilled in the treatment of any and every disease ; modifying the means to be pursued in carrying them into effect—to the age, sex, and specialities which necessarily attend every case.

115. CAUSES OF DISEASE—DIVISIBLE INTO TWO CLASSES—PREDISPOSING AND EXCITING ;—AND DISEASE DIVIDED INTO TWO KINDS—ACUTE AND CHRONIC.—With the view of appearing a little more practical, I must add that it should be ever borne in mind that two causes appear very generally necessary to the development of acute disease ; namely, a remote and an immediate one, or in other words, a predisposing and an exciting cause. I am now speaking, remember, of *acute*, or in other words, *active* disease, and such that is, in general, of sudden invasion ;—in contradistinction to *chronic*—which is usually passive in character—insidious in its invasion, and comparatively of slow growth. And thus it is, that during an epidemic visitation of disease—whilst many or all are exposed to the cause of the affection, cholera, or whatever it may be, so few comparatively are attacked,—the many being wanting in the predisposition or susceptibility to its influence. And the same holds good in all the ordinary cases of acute disease—and for which reason it is, that at one time, the slightest exposure to cold will upset the balance of the circulation, and occasion catarrh, sore-throat, fever, rheumatism, or the like—so susceptible is the system to the baneful influence ; whereas at another time, we may commit the greatest imprudence, or expose ourselves again and again, without the slightest inconvenience ensuing. The difference consists in this—that on the former occasion, predisposition to disease was in existence, or in other words—a repletion of the blood-vessels, or condition closely bordering upon it existed, whereby the smallest amount of derangement, or subtraction from the heart's force, or reduction of the blood's cir-

culating power—at once developes congestion and its consequences in the part more immediately exposed, or amenable to its influence; or else the liver, or other of the excretive organs was not performing its office efficiently—whereby the blood was left surcharged with the effete elements of the excretion—and the system became predisposed or amenable to disease, which accordingly now becomes at once developed by the agency of cold, or any other extrinsic and accessory influence, epidemic agency, or cause,—immediate and exciting, to which the system may be exposed. And thus too, analogically, at one period of life, we are amenable to the contagion of small pox, scarlet fever, the vaccine virus, &c.—but not so at another, or a second time;—the inflammable and peculiar element of the blood, which gave the predisposition to the attack in either case, being burnt out, expelled, or altered during the first attack, and no recurrence of the disease, therefore, subsequently ensues.

116. CHRONIC DISEASE.—The condition of the system previously pointed out as that of predisposition—is essentially the basis of that, which we call from its more enduring and less conspicuous character—chronic disease; which instead of being sudden in its attack, is generally progressive and accumulative in its tendency, and is therefore slow and stealthy in its invasion; the result of a constant accession to the quantity of blood—surplus to the requirements of the system, from excess of nutrition in one case; or the food or beverage taken being of unwholesome character or objectionable in its kind—and thus deteriorating the quality of the blood, in another; or the humidity of the spot, or the air of the locality in which the individual resides being deteriorated by malaria, or otherwise objectionable in character; or the individual not taking sufficient exercise, in the open air; or his mind being too actively or intensely employed; or his habit of smoking tobacco, or of intemperance of some kind—sexual, moral, or physical, being debilitating in character; and thus reducing the powers of the system—the heart in its office of circulating the blood—or the secretive organs in the fulfilment of their duties. And thus, in the first instance, congestion in some organ ensues, and this progressively developing irritation,—subacute inflammation follows; or in the second case, from the gradual accumulation of the effete elements of the defective secretions polluting the blood—gout, rheumatism, asthma, scrofula, consumption, eruptive and skin-diseases follow; or from their combined effects, sciatica, tic-douloureux,—or disease of the

liver, kidneys, lungs, heart, or brain,—with all the intermediate minor affections—called nervous and dyspeptic. In short, all the diseases to which man is heir, are by the operation of these and other causes of similar import,—that of deteriorating the blood, and inducing congestion—thus immediately or remotely developed; making good what I first said,—that the restoring the blood to its primitive purity and perfection, and reducing its quantity, if in excess of the requirements of the system, or of the powers to circulate it—are the principal objects—if not the sum absolutely—of all treatment.

If there be truth in what I have said—if the general indications in the treatment of every disease are as I have represented,—our remedies must necessarily bear reference, or principally so, to the purification of the blood; and as this can only be accomplished through the agency of the excretive organs, and natural outlets of the system,—to excite and increase the secretions of the liver, the bowels, the skin, and the kidneys, one or other, or the whole of them, as the circumstances of the case may indicate the necessity of, with the expulsion from the system of their disordering elements, would appear to be the chief points, or primarily so at least, in the treatment of every disease, concurrently with that of restoring the balance of the circulation—that is, of reducing, in such cases wherein it may be necessary, the quantity of blood to be circulated—to the power of the heart freely to accomplish it. Indeed it will be found, with reference to the first-named indication—that the function of one or more of the organs of secretion named, by the agency of cold or other deranging cause, having been thus rendered torpid or arrested,—is, very generally—indeed, in most cases, the immediate cause of the blood's vitiation and disorder, and therefore, of the disease; the natural impurities of the blood—the elements of the excretions, which are in constant production during every moment of man's existence—and which it is the office of these organs to eliminate, and thus divest the blood, being, by the arrest, wholly or in part, of the secretive function, now retained in, and polluting it.

If this be true, which it unquestionably is—the primary indication is, of certainty—to reinstate the function of the organ, whichever it may be, more particularly affected. And it must be for ever borne in mind, that the system is one indivisible whole,—that any general influence, therefore, such as of cold for example—although it may dominantly affect the skin,

and superficies of the body more particularly exposed to its agency—is far, very far, from being thus limited in its effects to such organ or part; a consideration, I fear, that is too commonly disregarded. If, therefore, it be the function of the *skin* which is suppressed, the restoration and excitement of the perspirable secretion is the first object to be held in view, and followed up necessarily by due attention to all the rest. If it be of the *liver*, the secretion of bile must be augmented, and the derangement of its function repaired; if of the *kidneys*, increasing the secretion, and restoring to the urine its healthy character; or if the *bowels*, should the blood by their torpor have become polluted, by the absorption from them of some effete matter, alimentary or other, which has become corrupted by undue retention, or received into them from the stomach in the shape of unwholesome food, beverage, or the like—these too must be got rid of.

And lastly, it will be perceived—that these, with impure air, intemperate or vicious habits of some kind, want of exercise, excess of mental employment, heat of climate or season, and a few more, constitute the whole, or nearly so, of the remote causes, and are the parents of every disease: and on a little reflection, it will be equally apparent, that one and all operate, immediately or remotely—primarily or secondarily—to vitiate and disorder the blood, and thereby derange its healthy manifestations,—and produce effects, successively, of disorder of all the organs, which accordingly—variously grouped and combined—constitute all the variety and complications of disease to which mankind is liable.

With these prefatory observations on the various causes of disease, and their operation in producing them—I shall, in the next chapter, proceed to explain the operation and influence on the system, of blood-letting, calomel, opium, purgatives, and all the more important remedies usually employed in the treatment of disease; which, it will be noticed, operate for the most part (by imparting their respective qualities to the blood—into which they are severally absorbed from the stomach—meaning of course those which are so administered) in a manner, analogous in kind—though in general antagonistic in character—to that of the several causes of disease, or agencies which have concurred in producing them.

CHAPTER VII.

OF THE NATURE AND OPERATION OF THE PRINCIPAL REMEDIES EMPLOYED IN THE TREATMENT OF DISEASE AND RENOVATION OF HEALTH ; NAMELY—BLOOD-LETTING, CALOMEL, PURGATIVES, EMETICS, SUDORIFICS, DIURETICS, OPIUM, TONICS, STIMULANTS, WARM AND COLD BATHING, ELECTRICITY AND GALVANISM, CHANGE OF AIR AND DIET, &c. &c.

117. BLOOD-LETTING.—If it be to the quantity and quality of the blood, and to its unequal distribution, that we must assign every disease,—blood-letting, as a remedy in the treatment of disease, must assuredly hold a conspicuous place. I mention this, as it has become a fashion of late to decry this remedy, and with many, indeed, to discard it altogether from practice, as being, they say, both unnatural and uncalled for. In reply to the first objection, it will be time enough to combat this, when man fulfils the conditions of nature—lives upon the herbs and fruit of the earth, and pursues the game of the forest before he cooks and devours it : but so long as he transgresses these laws, sits quietly at home in a warm and comfortable apartment, and has three or four meals served up to him daily—as fish, flesh, and fowl, with butter, sugar, milk, and wheaten bread,—and of which he eats to his heart's content without even the exertion necessary to the collecting or preparing of them,—so long as he thus takes food of the most nutritious kind, and in excess, but too often, of the air and exercise taken and the requirements of the system ;—and drinks at the same time as commonly, beer, wine, or other stimulating beverage—there can be little doubt in any reasoning mind—that the blood must become, and not unfrequently, too rich in kind, or too much in quantity, to maintain the healthy well-being of the system ; and that, in either of these cases, blood-letting, by reducing the quantity and quality of the blood—would prove the most simple, efficient, and I may add natural, of all remedies. And as such, it has been practised by mankind from time immemorial :—and indeed was, half a century ago, of almost universal practice, as a preservative against disease, at both spring and autumn in the agricultural districts of this country : and well it might have

been, when the breakfast consisted of bacon and beer! And in Syria, where fever is in some parts endemic—I read lately, that to lose a tea-cupful of blood monthly as a preventive measure, was the general practice of the people. And again—is it not a fact, that Nature, in her conservative wisdom and tendency, often points out to us blood-letting as a remedy in the treatment of disease?—coming as she often does to the relief of the individual—and thus the bleeding of the nose in youth, and of the piles in after-life. Or if this do not ensue, rupture of a blood-vessel not unfrequently takes place, either in the stomach or lungs—producing vomiting or expectoration of blood;—which I hold in most cases to be—not the disease to be arrested, as it too commonly is, but the curative efforts of the system which is oppressed—for its relief. Or if unfortunately the rupture takes place in the brain, then apoplexy or palsy ensues. And further, do we not see, how great is the periodical loss of blood sustained by the female, and still more so at the periods of parturition? No other arguments than those adduced, are required to satisfy my mind of the utility of the practice of blood-letting, on the ground at least of its being far other than an unnatural remedy: and for what other purpose, I would ask, were leeches, which are to be found in every country, created—but in the bounty and beneficence of Providence for man's use? And as a remedy, I would further appeal to the experience of every man who has been free to exercise his judgment, and who has had to contend with acute disease, and especially of Europeans in tropical climates—whether it be possible to treat such affections as inflammation of the liver, or of the bowels in dysentery, with any prospect of success without blood-letting—and that too, in no very limited quantity? And how in this country, are the more active forms of inflammation of the lungs or bowels, or apoplexy, or any disease—in which the quantity of blood to be circulated is in excess of the powers of the heart to accomplish it—to be satisfactorily treated without recourse to this remedy in some way?

In juxtaposition with the few objections that may be made against this remedy, let me place a few that I would advance in its favour. The first is—that it is not the antiquated stream, in my belief—but the new materials duly animalized—or those of *diurnal accession* to the blood—which nourish the body, and support the heat and healthy excitement of the system. The second is—that we grow decrepit by age, for the reason princi-

pally of the vessels becoming filled with the over-animalized products of nutrition, and the refluent constituents of the blood—of such as have become exhausted, or devoid of the healthy exciting qualities of the newly-formed blood. As it will be remembered—that it is the more fluid or serous part of the blood—which permeates the vessels and irrigates the surrounding structures—that alone imparts nutrition to the system.

Hence it is, that young blood, the product of early life, affords abundant nutrition and growth to all the structures—with an overflowing supply of animating spirit.

In conclusion, therefore, I maintain—that blood-letting is neither unnatural, nor is it, judiciously employed in the treatment of disease, in anywise hurtful in its tendency :—on the contrary I hold it to be precisely the reverse—conservative in its character. Its tendency being, to maintain the purity and youthfulness of the blood, and healthy excitement of the system—and therefore to prolong life. And with justice I may assert, as the fruit of forty years' professional experience, and the very frequent practice of it—and that too upon my own person not less than twenty times in the same period of time (and I, be it observed, am the only survivor of a family of ten brothers and sisters—some younger than myself)—that of all remedies judiciously employed, blood-letting is one of the most valuable—and indeed, in many cases of disease, the only one that can fulfil the requirements of the case. And finally, were it more generally and actively employed than is the case in the present day—the number of sudden deaths would be much less numerous, and disease generally more successfully treated—is the sincere conviction of one who—with all becoming modesty—yet does not hesitate to aver—holds his opinion in this matter as second to that of no man's.

With these prefatory observations, in vindication of the practice of blood-letting from the odium which has of late been cast upon it, and prejudices of the day, I may add—that as the quantity of blood circulating in every man's system, is equal to at least a fourth part of his weight, and may therefore upon an average be estimated at thirty-five pounds,—it is not the loss of a limited number of ounces, nor of a few pounds upon an emergency,—that can, where the slightest judgment is exercised in its use, prove half so calamitous as the disease when allowed to run riot by neglect of its adoption !—I shall now proceed to point out the indications which blood-letting fulfils, and the operation and influence of this remedy in the treatment of disease.

118. OF BLOOD-LETTING ;—ITS OPERATION AND INFLUENCE IN THE TREATMENT OF DISEASE.—Bleeding, to be useful, must necessarily bear reference—not only to the quantity of blood withdrawn from the system at one operation, and the manner of its adoption, but to the condition of the patient, the age, sex, and stage of the disease at the time it is practised ; as well as the nature of the causes—predisposing and exciting, which have given rise to it. In congestive disease, the balance of the circulation has been disturbed—the resistance to be overcome by the heart's power exceeds its force or momentum, and the result is, congestive accumulation in the vessels most remote from its influence. And this may arise from one of two causes—either the quantity of blood being surplus to the necessities of the system and the ordinary force of the heart, as in the case of simple plethora,—or the heart's power, by the agency of some debilitating cause operating upon the blood and through the capillary system, is reduced below the healthy condition, and force adequate to keep the whole volume of blood in free circulation,—when congestive repletion ensues. And this may be little or much in degree, or limited in extent to a part in which predisposition exists, or debility—natural or acquired, predisposes to be the seat of its accumulation ; or in which, peculiarity in the distribution of the blood-vessels of the part, as in the case of the liver, the spleen, and portal circulation—in which the blood has a double course to pursue, the accumulation is most likely to take place. And again, the debilitating cause may be partial or limited in the extent of its operation, and thus produce, from defective capillary excitement in the part, local congestion.

In thus viewing congestion, it is clear, that blood-letting, judiciously employed, must prove a very valuable remedy. The essential object in all cases being, with reference to the cause and circumstances of the case, to adjust the balance between the power to circulate, and the quantity of blood to be kept in circulation. In simple plethora, to withdraw blood in quantity commensurate with the surplus, is, by the resistance removed, to give vigour to the heart—and thus to convert what, before bleeding, was a contracted, oppressed pulse, into a full and energetic one ; and thus it adds strength to the system at large.

But under other circumstances of congestion—when the cause is a debilitating one, we must not forget to take into account, whether this be of a permanent or a temporary character. And we must ever bear in recollection, when blood-letting is had

recourse to, which it often may be with great advantage in these cases—that this remedy bears directly upon the heart's function, which is in no slight degree dependent on a certain amount of distension, in relation to the supply of blood afforded to its own substance, and to that of the brain also, as well as to the distension of the heart's cavities. We must therefore be guarded in the quantity we take at one operation—that the heart and vessels of circulation may have time to draw upon the congested part, and accommodate themselves to the loss sustained, and be not, by excess, immediately weakened by the operation. With these precautions, it may not only be practised, but in many cases may be repeated at short intervals several times, with the greatest benefit, in congestive disease of this character, as well as in the inflammatory affections of the several organs, which congestion, when allowed to exist for a time, so constantly develops, and in the prevention and cure of which, this remedy is accordingly so frequently indicated. It must, nevertheless, be borne in mind—that the blood, propelled from the heart through the aorta by its contraction, has to ascend the carotid arteries in opposition to its gravity, when the individual is in man's distinguished attitude, the erect position. Full distension of the aorta, under these circumstances, appears therefore indispensable to the blood's ascent to the brain, inasmuch as it would otherwise assuredly take the course of least resistance—the descending vessel. Hence, the fainting, or deprivation of the senses which ensues upon a copious bleeding,—the brain, as well as the heart, being, in consequence of this want of distension, defectively excited. Hence too, another necessity for caution in the use of the lancet in congestive disease attended with prostration, and a reason why local bleeding, by leeching or cupping, is in general to be preferred in such cases,—as well as the great importance of keeping the patient scrupulously in the recumbent posture in cases of the kind.

119. INFLAMMATION.—The connexion between inflammation and congestion is, as I have before explained, most intimate: they stand in relation to each other, in most cases, of cause and effect; congestion of the veins giving occasion, by impeding the blood's egress from the arteries, to excitement of the capillaries. Excitement is, therefore, its distinguishing characteristic; and which, a consideration of the quality of the blood, and the amount of the distension of vessels, will, I am of opinion, satisfactorily explain. The congestion, with respect to quantity in one case,

being overwhelming in amount, from the depressing cause being so virulent in character—as when a poisonous dose of opium has been taken, or as in the case of the poison of a serpent—as to prevent reaction ; or the distension extending to the arteries in another—may be prevented by increased secretion, or serous effusion in the part ; and in a third case, it may exist in a degree, to the production alone of the intermediate state or the excitement of febrile irritation. These are all instances, various in kind, but short of the required degree,—but, on this occurring, inflammation is developed ; and more especially so, in certain conditions of the blood—in relation to its chemical qualities favouring the development of caloric and electricity, and its consequence—excitement. Bleeding, in this case, it is obvious, fulfils a twofold purpose : it relieves the congestion, which in general is considerable, at the same time that it reduces in amount the combustible qualities of the blood ;—and as these may be supposed to exist in a ratio with the more or less exalted state of the inflammation, we have in the latter a test for its employment—which may be local or general, dependent on the seat of affection, and to a greater extent at one operation, generally speaking, than in simple congestion, for the reasons assigned. And moreover, when general bleeding is required, as in high synochal or inflammatory fever, or in inflammation of the more important organs of life, which can only be influenced through the general circulation, it may be often very advantageously carried to the extent of inducing fainting,—or the abeyance of the brain's function ; as well as the perspiration of relaxation which accompanies that condition. Taking the blood in this case suddenly from a large orifice, the patient being in the erect or sitting position, and repeating the operation a few hours afterwards, or as often as may be required, in conjunction necessarily with other proper remedies ;—remembering in these cases, that if inflammation be not speedily relieved, it will often prove destructive to the organization of the part affected, and the life of the individual !—and as such it is better to err on the side of taking a little too much than a drop less than sufficient !

120. OF THE PULSE, AS AN INDEX TO BLOOD-LETTING.—When associated with the cause, character, and circumstances of the case—from the pulse much useful knowledge may be gained ; but if fulness and strength of pulse are to be taken as the only indications for the use of the lancet, I must say with Celsus—“ that the pulse is the most fallacious of all things ;” and these, alas ! at the present day are but too commonly considered the only rightful

tests! But a little reflection will prove, that this is a most mistaken and impotent conclusion. Thus with the greatest amount of congestion, there is necessarily the smallest quantity of blood flowing through the heart and arteries; and accordingly, the pulse is the smallest and weakest—and yet experience proves to us that blood-letting is not only indicated, but if judiciously employed, withdrawing the blood in small quantities at a time, and repeating the operation at short intervals, that it is not only a useful, but often the most valuable remedy we can have recourse to—in conjunction with suitable stimulants. Again, a contracted, oppressed, or tense pulse evinces a state of the circulation which admits of, and very generally is much benefited by, the use of the lancet. A full and firm pulse, and especially when energetic, numbering from 90 to 100—which is the case in active inflammation—admits of its free and unflinching employment. In visceral inflammation*, and more especially of the membranous and more sensitive tissues, the pulse is more frequently irritable, contracted, and numbering from 100 to 120—and in these cases also, bleeding is unquestionably called for. Whereas a soft, very frequent, or feeble pulse, as assuredly forbids its use in a general way—though there are exceptions, even in such cases, to this. The conditions of the pulse here named, are those which so frequently attend fevers of the remittent and low type; and as these are more commonly than otherwise attended with some local affection, leeches, in relief of the congested or inflamed organ, often become auxiliaries of the utmost importance to the successful issue of the case.

121. OF MERCURIALS IN THE CURE OF DISEASE, AND OF CALOMEL IN PARTICULAR.—Whatever be the preparation of mercury administered, the condition in which it is received into the system from the stomach, I believe to be that of a chloride, seeing that it must first be subjected to the influence of the hydrochloric acid of the stomach's secretion, and dissolved before it can be received into the circulation. Hence it is, in my opinion, that calomel (the chloride of mercury) is so much more certain and determinate in its effects, and therefore so superior as a remedy, to every other preparation of mercury we possess.

The operation of all remedies received into the stomach, I believe to be in admixture with the blood, after their absorption from the stomach. Experiments long since made have established

* See Mr. Travers's observations on blood-letting in Note, Chapter X.

this in my mind beyond question*. The stomach, nevertheless, is subject, doubtless, as much so as the skin, to irritation and other influence of local character, operating upon its surface; and thus, therefore, through its nervous sensibilities may it also be affected, as well as other organs in connexion with it. But neither calomel, jalap, rhubarb, wine, nor the generality of things administered as remedies, do so specifically operate—no, not even ipecacuanha! An infusion of this substance, injected into a vein of the leg, operates as an emetic in a tenth part of the time required by any quantity administered by the stomach; and the same with jalap, when thus administered as a purgative. These and all other remedies, when taken, are accordingly first absorbed into the blood, and each, during its circulation severally operates in its own particular way—jalap as a purgative, and ipecacuanha as an emetic; either directly upon the organ influenced, or indirectly, by first influencing the brain and nervous connexions of the part. In proof of this, the same remedies applied to a blistered surface, from which they become severally absorbed, operate in like manner, as when taken into the stomach, or injected into a vein.

122. MERCURIALS INCREASE CAPILLARY EXCITEMENT.—Calomel, when absorbed by the veins of the stomach and bowels, in its passage with the blood through the liver, to which organ it is immediately conveyed by these vessels,—excites this organ, immediately and directly, to increased secretive function: hence the bilious evacuation which so constantly succeeds to the use of a grain or more of this remedy. Proceeding from the liver, and admitted into the general current of the circulation, its operation, in common with all other mercurials, I believe to be specific on the capillary vessels at large, exciting them to increased action. Hence, its general influence as a stimulant to the whole system, its renowned deobstruent power, and operation on the glandular system—in increasing all the secretions. Its operation in exciting the capillary arteries, and thereby secretion, necessarily removes obstruction from these, the principal exhalant vessels, and congestion from their venous terminations,—and thus is exudation from the latter prevented, and absorption, as a consequence of generally increased capillary excitement, at the same time increased; and hence the accredited action of mercury upon the

* If gin, or other spirit be drunk, alcohol, a part of it, can be detected soon after in the fluids of the brain, at least it is so said; and many saline substances can be detected in the urine, a few seconds after they have been swallowed.

absorbents in removing exudation and depositions of whatever kind, and the various dropsical effusions. Its operation on the capillary system being general, the action of the heart and that of the brain, through the medium of their organic structure, is excited also; and in short, all the functions. It thus operates, probably, by imparting qualities to the blood by which its constituent elements may have a greater affinity for oxygen, the vitalizing principle; and thus may increased chemical action in the blood, and its consequence—excitement—take place throughout the system. But whether this be the mode of its operation or not, the effect is, as I have described it—excitement of the general system: it is, therefore, in the treatment of disease, my lengthened experience fully justifies me in asserting, the most generally, and beneficially useful, of all remedies.

123. INDICATIONS WHICH MERCURY FULFILLS.—The power of mercury in increasing capillary action, is further evinced by the febrile commotion it excites in the system, and the inflamed blood of those under its more abundant influence—effects succeeding to its exhibition, which should be carefully watched—generally occurring when it has ceased to operate as an evacuant, and when they arise, its further use in a general way should be prohibited; though in some cases it may be thus employed with great advantage, upon the principle of exalting the general excitement of the system, in relief of a local or partial affection of the kind. But speaking of its employment in a general way, it may be observed, that the indications for its use in inflammatory affections are limited to the atonic stage, and that of oppression and congestion which precede them. In no case should it be given in the intermediate or more active stage of inflammation, involving the heart's excitement, save in very guarded doses, and in conjunction with other evacuants. But when the more active condition of inflammation, or of fever, has been moderated by bleeding and other evacuants, or when debility has succeeded to the previous excess of excitement—the atonic condition of these affections of the capillary system,—its administration supports a due action of the capillaries, excites the secretions, and invigorates the heart's action, in common with the rest of the functions, and accordingly becomes our chief remedy; and in severe cases—carried to the extent of inducing salivation—which appears to mark its ultimate effect for good—is of all remedies the most valuable.

124. CALOMEL; ITS EFFECTS WITH REFERENCE TO QUANTITY.—Upon the subject of quantity, I have a few observations to make

of much importance. I have endeavoured to prove, in various parts of this essay, that all agents, in their operation on the system—whatever those agents may be—whether physical or moral, whether operating upon a part of the system, or upon the whole—have their effects determined, and in all cases bounded by the quantity of influence, or amount of the agency employed. Thus wine, in moderate quantity, produces exhilaration and excitement—excess of it atony and death. Heat in moderation produces excitement—excess of it, as in a severe burn or scald, mortification and death. The reverse of heat—cold in like manner, within a certain range, as in the plunge of a cold bath, produces a glow and excitement; a greater degree of cold produces congestion and fever; and extreme cold, palsy and death. Anger in moderation produces vehemence and excitement; extreme anger or rage, on the contrary, often deprives the person of utterance and propriety. Fear will induce a man to flee; fright, on the contrary, fixes him to the spot. In extreme grief, no tears are shed; in moderate grief, they flow abundantly. Enough has been said, I think, to establish the fact I have in view, and which, in reference to its application in a variety of ways, has been too much neglected, and especially so in the administration of mercury. A grain or two of calomel, my experience justifies me in saying, will in all cases—unless there exist some specific disease obstructing the blood in its passage to or through the liver, with very few exceptions, produce one or more bilious evacuations: this it does, by moderately exciting—that is, increasing the natural action of the liver, to which it becomes, when absorbed from the stomach, immediately applied. If the object therefore contemplated in the administration of this remedy, be the increase of the biliary secretion, it should be given in a quantity limited to from one to three grains; whereas it is an every-day practice to give it in a large dose, to prevent, as practitioners say, its griping the patient. Now, griping, I maintain, is the natural effect of an acrid condition of the bile in its passage through the bowels, from its having been long retained in the liver or its appendage—the gall-bladder: and if this therefore take place, when I administer a small dose, I hail it as the best evidence that the remedy was required, and in the dose in which I have administered it; feeling assured by this—that I am thus dislodging an enemy—and the cause, not unfrequently, of all the patient's ailment. Whereas a large dose,—what does it do? It so hurries the circulation through the secretive apparatus, that the excess

of excitement paralyses the natural endowment of the part, and consequently there is no secretion effected, or a secretion of an altered kind, and perhaps without griping. This, in some cases of disease, may be a very proper measure, and I know it to be so, but not in the fulfilment of the purpose mentioned—namely, that of increasing the ordinary biliary secretion. The stomachs of some persons cannot, however, tolerate calomel; but they can the blue pill: to such, of course, let the latter be given, in doses from three to five grains, in substitution for calomel.

125. CALOMEL; ITS VALUE AS A REMEDY.—The fruits of my experience justify me in declaring—that if there be any single remedy in the cure of disease, meriting the name of *universal*, that remedy is calomel. The explanation I have given of its operation, and the universality of its influence on the system—in exciting the functions of all the organs, and increasing all the secretions, renders it evident, I conceive, that it fulfils indications of one kind or other, in the treatment of every disease. Every disease being, it may be truly said, with very few exceptions indeed, based upon depression of the active energies of life; and all upon impurity and disorder of some kind affecting the blood. Health, as I have before said, consists in the due action and efficient performance of the various functions of the system, and these upon a pure and well-conditioned blood. Judiciously employed, I can say with confidence, in opposition to much prejudice on the subject, founded on the circumstances which first introduced it into this country, and its too commonly improper mode of administration (the principles by which its employment should be regulated not being understood),—that calomel, provided every proper precaution is taken against cold, is as harmless as iron, or any other of the numerous articles of daily remedial administration. This conviction, be it remembered, is the fruit of forty years' experience, twenty of which were spent in India, where this is the chief remedy employed in the cure of disease, and one of universal use both by native and European practitioners.

126. PURGATIVES.—Of all remedial agents, purgatives are unquestionably the most generally useful. We are all apt to eat and drink too much, or disorder our bowels by improper articles of diet or beverage, or otherwise the bowels become constipated from excess of mental employment, or by our not taking sufficient bodily exercise. Irrespective of which considerations, the mucous secretion of the bowels is increased by the agency of purgative medicines, and the blood-vessels in connexion with the liver

are thus to a certain extent unloaded, to the relief of that organ, which is very prone to become congested—and thus the frequency of constipation and headache. The most useful of this large class of remedies are—senna, jalap, rhubarb, castor oil, aloes, and magnesia. Calomel and blue pill I have already mentioned—observing that they operate as purgatives, by increasing the secretion of bile, which, passing into the bowels, excites them to action : but they do much more than this—they excite and increase all the secretions—and that of the mucous membrane of the bowels, in common with other purgatives ; that, as purgatives, they are unquestionably the most purifying in their character of any we possess ; and hence the universality of their employment. This leads me to point out the following pill, as a most excellent purgative and remedy for at least half the ailments to which man is liable. Take of calomel, socatrine aloes and Castile soap, of each 12 grains, mix, and make into 12 pills : take one at night, or at any time it may be required, and repeat it if necessary. The aloes are here added to the calomel, to accelerate its action through the bowels, and thus supersede the necessity of following it up with a black draught, or other purgative, as so commonly practised. This pill may be taken by male, female, or child ; in the latter case, half of one reduced to powder, with a little sugar or jelly, will be the best form of administering it. Or if the mercurial is objected to, the following is an excellent pill in costive habits, taken occasionally an hour before dinner :—Socatrine aloes twenty grains, extract of hop thirty grains, mixed, and divided into twelve pills. Senna, jalap, and castor oil are also very useful purgatives, and speedy in their operation. The first is given in the form of tea, by infusing a quarter of an ounce of the leaves in a quarter pint of boiling water, till cold, and taking a large wine-glassful, or the whole of the strained liquor. It is generally thought advisable to add a tea-spoonful of Epsom or Glauber salts to the infusion, rendering it thus what is usually called a black draught. For children, a quarter of an ounce of manna, or a tea-spoonful of brown sugar, may be substituted for the salts, and half of it given for a dose. Jalap is generally taken in powder, from twenty to thirty grains as a dose, with an equal quantity of cream of tartar, and is an active and very efficient purgative. Castor oil, in the quantity of a table-spoonful, or two, —that is, half an ounce, or more, is both mild and efficient in its operation ; and in the dose of from a tea-spoonful to a table-spoonful, is well adapted for children and delicate females. It

is the practice in India to give to new-born babes a tea-spoonful with a little warm water and sugar daily for a month or more; and it is surprising to see how they thrive upon it: it appears not only to keep the bowels in good order, but to nourish them as well. Rhubarb acts more immediately upon the stomach and upper portion of the intestines, exciting them to action, and constringing them afterwards: it is more particularly useful, therefore, in cases of stomach disorder and relaxed bowels, than as an efficient purgative. As a purgative, it is given in the dose of from twenty to thirty grains of the powder; and with the former intentions, in the quantity of from three to six grains, two or three times a day.

Salts, or the saline purgatives of various kinds, all operate by increasing the mucous secretion of the bowels, along the whole line of their surface, and hence the watery evacuations which so generally attend their operation. In this way they influence the circulation, in proportion to which they deplete the vessels of the bowels, and are therefore justly considered very relaxing; and in diseases of excitement, where this class of remedies is called for, are often, for these reasons, to be preferred. The more generally useful are, the sulphates of magnesia and soda—the first called Epsom, and the last Glauber salts. As purgatives, they are given in solution, in doses of from a quarter to one ounce by weight, in a small tumblerful of warm water, or in combination with senna tea.

127. SALINE DRAUGHTS.—In smaller doses, both Glauber and Epsom salts, in common with all other saline purgatives, increase the secretions of the skin and kidneys; and are accordingly frequently employed with those intentions, as well as with a view to their operation on the bowels—and hence the value of these and other saline medicines in fever. The liquid acetate of ammonia, which is often, in such cases, given, as well as the ordinary saline draughts,—made by adding twenty-five grains of bicarbonate of potass, dissolved in a sufficient quantity of water, to a table-spoonful of lemon-juice; or if to be taken in effervescence, by suddenly pouring the one into the other, contained in a large tumbler, at the moment of swallowing it. Seidlitz and soda-powders fulfil the same purposes.

128. MAGNESIA.—This substance is more particularly given in cases of heartburn or gout, or cases in which the presence of an acid is supposed to exist or predominate in the stomach and bowels. In such cases, this is unquestionably a very useful

remedy, in the dose of a tea-spoonful or more; combining as it does with the acid, it forms a neutral purgative salt, and passes off by the bowels and kidneys. In the derangement of the bowels in infantine life, and of young children, in combination with rhubarb, it is also a generally acknowledged useful remedy, in doses of half a tea-spoonful of the first, with five or six grains of rhubarb, in combination with a little ginger, which compound is commonly called "Gregory's Powder."

129. EMETICS.—These are remedies which operate by provoking vomiting, or the expulsion of the contents of the stomach upwards. It must not, however, be supposed, that the operation of an emetic is confined to relieving the stomach of its contents—far otherwise: the operation of those that nauseate—which is the case with the tartrate of antimony, and ipecacuanha, those most in use—is productive of a copious flow of mucus into the stomach and bowels, and from the membranes also of the lungs and air-passages; and it very generally occasions perspiration likewise. The act of vomiting is attended also with a sudden compression of the liver and bowels, and expulsion frequently of the contents of the gall-bladder. Its influence is further extended to the circulation in the brain, and it gives a general impulse to the system: however antiquated and out of fashion in the present day, it is a remedy of unquestionable value, available to many useful purposes in the cure of disease, and of the congestive kind more particularly. Of these remedies, those most in use are, tartrate of antimony (emetic tartar) and ipecacuanha. Two grains of the first, dissolved in two table-spoonfuls of hot water, or twenty grains of the last in powder, will in general fulfil the purpose efficiently. A delicate person or child may take half or less of either, and repeat the dose ten minutes after if necessary. When vomiting has commenced, warm water should be drunk abundantly to assist its operation.

There is a solution of antimony sold in the shops, called antimonial wine—and also wine of ipecacuanha; both very useful preparations, well adapted for children. Twenty or thirty drops of either, in combination with as much syrup of poppies, given every ten minutes till it operates as an emetic, while the little patient is confined to a warm bed, in coughs or colds, or slight febrile affections, will not only cure those, but often, in so doing, avert inflammation of the lungs, or croup and the like more dangerous affections. Adult persons may adopt the same remedy in proportionately larger doses, with equal benefit.

130. **ANTIMONY, THE TARTRATE OF.**—I have already mentioned its use as an emetic; in addition to which it is an exceedingly valuable remedy in the treatment of inflammatory and other febrile affections. It appears to me to operate upon principles exactly, or nearly so, the reverse of calomel and mercurials: indeed, some writer has recommended it as the best antidote to the effects of the latter. Instead therefore of exciting, it has the power of reducing the action of the capillaries and excitement of the system. In the acute forms of inflammation of the lungs or pleura, or in the more active conditions of excitement of the system or fever, it is therefore justly extolled as one of our principal remedies—second only to that of blood-letting, and often superseding the necessity of the latter also when given to as great an extent as the stomach will tolerate—that is, short of its provoking vomiting;—in doses therefore of from one-eighth part to a third of a grain, every hour or two. In which doses, given every two or three hours in most cases of disease attended with heat and dryness of the skin, it seldom fails, especially when combined with its weight of opium, in producing perspiration, and proving highly beneficial.

131. **DR. JAMES'S FEVER POWDER.**—This celebrated preparation, and the antimonial powder of the apothecary, are supposed to be the same, or nearly so; and are both employed in doses of from two to six grains, in the same cases and with the same intentions, in inflammatory and febrile affections, as the preceding preparation.

132. **IPECACUANHA ROOT.**—This is a remedy which operates much in the same way as the tartrate of antimony. In doses of from fifteen to twenty grains of the powder it operates as an emetic; and again in the smaller doses of from a quarter to one grain, it nauseates the stomach, excites expectoration, and tends to induce perspiration.

The wine of ipecacuanha, like that of antimony, is a very useful preparation for children; and is given in the same doses and with the same intentions as the latter. Either of them, combined with equal proportions of syrup of poppies, and camphorated tincture of opium, is an excellent remedy for coughs either in adults or children, in doses of from twenty drops to a teaspoonful, according to age, every two, three, or four hours.

Upon the emergency of any person having swallowed poison, or of an attack of cholera, it is well to know, that a table spoonful of mustard flour, or as much common salt, dissolved in a

tumblerful of warm water, will soon operate as an emetic; or if not, the dose must be repeated till it produces the desired effect, assisting it, if necessary, by tickling the fauces, or inside the throat, with a feather.

133. SUDORIFICS are remedies employed to excite perspiration. I have already mentioned two of the most efficient—antimony and ipecacuanha; and have with respect to them only to repeat, that when combined with opium, which quiets the system, they seldom fail in reducing excitement and producing perspiration. A grain of ipecacuanha, in combination with as much opium in powder, and eight grains of sulphate of potass, constitute the celebrated remedy called “Dover’s powder,” and may be thus taken by an adult in a dose of ten grains, which contain one grain of opium, on going to bed, with a basin of warm gruel an hour after, in the case of catching cold, with the best effect; and with which, if two grains of calomel be taken at the same time, the effect will be doubly beneficial—by the bilious secretion it will give rise to, and relief of the bowels on the following day. Or three grains of Dover’s powder may be taken every two hours till sleep is induced, which in this case is very generally followed by perspiration, in coughs, cold, rheumatism, sore throat and the like affections; but if these cases are accompanied with heat of skin and febrile derangement, the benefit will be much enhanced, if each dose of the powder be dissolved and taken in one of the saline solutions—as a table-spoonful of the solution of acetate of ammonia, or twenty grains of nitrate of potass (saltpetre), dissolved in a wine-glassful of water; and if, conjointly with the first dose, two grains of calomel be taken, the benefit will be increased still more.

134. HEAT.—However applied or induced, heat is favourable also to perspiration; but this is applicable alone to those who feel cold or chilly. Hence immersing the feet and legs in hot water for ten minutes, and taking a large tumblerful of weak warm wine and water, or a basin of treacle-posset, in a warm bed, is frequently had recourse to with success. Or the vapour, or hot water-bath, may be had recourse to with the same beneficial results.

Heat, as an exciter of perspiration, has however, like all other agents, its limits in this respect for good. Hence the fact, that in the extreme heat of some fevers, it is not till the temperature declines, or has been reduced by the agency of cold ablutions or the like, that perspiration ensues;—but which, as in the case of

intermittent fever, it now does abundantly : and hence the beneficial use of cool air, salines and other refrigerants in most febrile and inflammatory affections.

135. THE LAMP-BATH.—This is another method of inducing perspiration much practised by the hydropathist, and which I was the first to devise, and bring into use, as far back as 1819, as a remedy in cholera, and denominated the *spirituous vapour-bath*. It is very efficient, extremely useful, so simple in the mode of its application, and always available, that I am of opinion it cannot be too generally known. It consists in the patient's being seated on a folded towel on a cane-bottomed chair, with his feet immersed in a pan of hot water; when a lamp, with a cotton wick of not less than one inch in diameter, containing half a pint of spirit of wine or other inflammable spirit, is lighted, and placed on the ground beneath the seat of the chair. A blanket is now thrown around the patient and chair, and trailing upon the ground is kept distended and secured around the neck—so as to prevent the escape of the heated vapour, and for the same purpose, a couple more blankets or other bed-covering is thrown over and around the first blanket. The vapour, being thus retained, soon heats the patient and elicits perspiration, which may be continued for half an hour or longer.

If a cane chair is not at hand, any other will answer the purpose. And again, if a spirit-lamp is not available, the same purpose will be answered by filling a tea-cup with the spirit and inflaming its surface. But in this case, to prevent mischief by accident, the cup should be placed in a basin or soup-plate of water, and the spirit should not be ignited till it is placed under the chair. After removal from the bath, the patient should be instantly washed with tepid or cold water, and well rubbed dry. In hydropathic establishments, where all the appliances are at hand, the patient is immediately immersed in a shallow-bath : for which see "BATHS."

136. A WARM HUMID POULTICE, or several folds of cloth wrung out in warm water, and applied to the whole of the chest or abdomen, is another excellent remedy in most febrile and inflammatory affections : it not only reduces the temperature of the body by the gentle evaporation from the part, but in so doing, as a conductor of electricity, it abstracts this and excitement from the system in general, and thus favours both perspiration and sleep.

137. IMMERSION IN WARM WATER—is a remedy of similar character ; its operation is however more general, its tendency is

to equalize the circulation and reduce the general excitement of the system.—It is therefore especially applicable to inflammatory affections in general; and if of the head and excitement of the nervous system, the bath should not be too hot, but of a temperature the most comfortable, and indeed should be so in all cases, and maintained so by the occasional addition of hot water, for half an hour or much longer; the back of the head and ears should be immersed, and the water baled from a jug over the fore part and rest of the head during the same period. The use of the bath in these and other cases of acute inflammatory affections, to be a remedy of much value, requires to be frequently employed, that is, every three or four hours at least; and the period of immersion as long as possible. Sponging the head and skin, with tepid water during the periods of exacerbation, in the remittent types of fever or the affusion of a bucket of cold water over the head and body, is a remedy also of much value; or a plunge during the hot stage of intermittent fever into a cold bath, is equally beneficial.

138. HOT FOMENTATION.—In chronic congestion of the liver—hot fomentation is another remedy of great value; and the same may be said—when applied to other of the organs of the chest or abdomen, or indeed any part that may be painful or inflamed. But to be useful it must be done efficiently, and continued, without slopping the patient, for three quarters of an hour or longer at a time.

139. DIURETICS.—These are those agents which increase the secretion of urine:—the principal remedies of this class, are certain saline solutions, dandelion, squills, digitalis, the sweet spirits of nitre, and oil of turpentine; cantharides, colchicum, and mercurials. The liquid acetate of ammonia, the acetate of potass, and saltpetre, are the principal of the saline preparations. The operation of these, and indeed of all the saline kind is, however, materially influenced by the circumstances under which they are taken. If the patient be confined to a warm bed, they will as often operate upon the skin as upon the kidneys; but if the patient be up and kept rather cool than otherwise, it is then that they increase the secretion and pass off by urine. This is not the case, or rather perhaps I should say is not so evident, with those of the vegetable kind, of which dandelion both root and herb, squills, senega, and digitalis are the best; each of which has, however, some distinctive characteristic. It is in general considered advisable to combine them, and adapt the combination

to the particular circumstances of the case. The weak salines with digitalis or squills being adapted to cases in which fever or inflammation is present; the others being all more or less stimulant in character and better adapted to the chronic and congestive class of cases. Colchicum is said to have some special influence in increasing the excretion of urea by the kidneys, rather than that of operating as a diuretic, and hence its utility in gout and rheumatism more particularly. Calomel, and mercurials, operate by increasing the secretions in general, hence, in combination with digitalis and squills, the compound is found the most efficient diuretic perhaps that we can employ. Of this, and the other diuretic compounds, we shall speak hereafter, in their application to the treatment of each particular disease.

140. OPIUM.—This is the chief representative of the anodyne and narcotic class of remedies. Opium is a compound body possessing a stimulant quality combined with a narcotic. Its effects therefore are twofold, and bear relation to the condition of the patient, and the quantity and mode of its administration. In small doses—that is from an eighth part to a quarter of a grain given every hour or two, its stimulating qualities are more particularly discernible, and this may continue till a grain has been taken (though double this quantity may be required) when its more important narcotic effects become paramount,—and relief from pain, and sleep, very generally ensue. If heat of skin and excitement be present, it is accordingly considered objectionable, unless its stimulant qualities are moderated by the agency of some remedy of an opposite class,—this is often very effectually accomplished by combining it with half, or one-third of its weight of the tartrate of antimony, or its own weight of ipecacuanha—as in the compound called “Dover’s powder,” when the combination is found infinitely more effective as an anodyne,—as it in general produces perspiration, and this reduces irritation and excitement, and thus soothing the system, favours the operation of the narcotic and sleep.

If the object of the administration be however—the more immediate relief of pain and nervous irritation—the purpose is better fulfilled by the exhibition of the opium in a much larger dose—from half a grain every hour or two, to two grains—according to the age of the patient and emergency of the case;—when its narcotic influence is found to supersede its stimulant operation, and sleep soon follows, provided inflammation and fever are not present, which prohibit its use, unless bleeding is conjoined, or

it be combined with antimony, or ipecacuanha and salines, or the warm bath—or better, the conjoint use of the whole of them.

To relieve pain however, or procure sleep, you must first know the cause of it. As it would prove a ridiculous attempt to relieve pain in the bowels—dependent upon the presence of an irritating substance within them, or on constipation, or inflammation, by opium, and neglect the more important remedy of a dose of castor oil or other agent that the case may more properly require. Laudanum, is but a solution of opium—thirty drops contain about one grain of opium; being in solution its effects are more immediately obtained than in the solid form.

Hemlock, henbane, and prussic acid are all valuable remedies of the sedative class, but as their employment and use are limited in character to especial cases of disease, we shall reserve what we may have to say, respecting these remedies, till we treat of the diseases to which they are severally applicable.

141. TONICS.—The idea associated with this word is something which imparts strength to the system by its constringing agency. Such may be the operation of some of the remedies thus designated, among which may be mentioned the astringent barks, the astringent salts, and some of the mineral acids; but there are many remedies of the tonic class which have no such operation. I shall therefore without reference to any operation of this kind, speak of tonics, as they severally operate to improve the quality and condition of the blood, and thus impart tone to the system and improve the general health.

The cinchona bark, and its essential salts, of which the sulphate of quinine is the principal, stand justly pre-eminent among this class of agents. The cascarilla bark stands probably next to it, followed by calumba-root, gentian, quassia, and the rest of the bitter tribe. The crowfoot or *nux vomica*, of which strychnine is the essential salt, is another very powerful agent of this class:—but its more especial exciting effects on the brain and nervous system, limit its use to certain cases of atony or paralysis, and affections of this class, and with respect to which we shall notice it when treating on these subjects.

Returning to the cinchona bark and sulphate of quinine. A decoction of the bark made by boiling an ounce of it in coarse powder in a pint of water for ten minutes, and straining off the decoction whilst hot, forms one of its best preparations. It must be shaken up when taken, as its virtue resides very largely in the matter which is deposited when the decoction becomes cold. As

a tonic—a large wine-glassful of this with a tea-spoonful of the tincture of bark may be taken two or three times a day, and to which may be added with great benefit when the appetite is impaired from ten to twenty drops of the diluted nitric acid; or in substitute for this, when a stimulant is required, as in hysteria and the like nervous affections of females, three or four grains of carbonate of ammonia.

Instead of the bark, the following solution of quinine may be preferred. Twenty grains of the sulphate, dissolved in two drachms of diluted sulphuric acid, to which six drachms of the tincture and two ounces of syrup of orange-peel are to be added. A tea-spoonful, or two, to be taken two or three times a day. As a remedy in the intermittent and remittent class of fevers, I shall defer what I have to say on the subject, till treating upon these affections.

The cascarilla bark is taken in decoction made in the same way as that of the cinchona. It is more stimulant in character and supposed therefore better adapted to the convalescents of gout, and the nervous and dyspeptic, than the cinchona—which is to be preferred in the debility succeeding to febrile affections, though unquestionably applicable in many of the former cases also.

Calumba-root is taken in powder, in doses of from six to ten grains, in stomach and biliary complaints two or three times a day; or in infusion, of two drachms of the bruised root to half a pint of boiling water, in doses of a large wine-glassful. Its influence accords more with that of the simple bitters, as of gentian, quassia and the like. These and all the class operate, we may suppose, on the sensibilities of the stomach, in improving the secretion of that organ, and by adding certain qualities to the blood conducive to health in which it may be deficient.

142. THE MINERAL ACIDS.—The sulphuric, the nitric and the hydrochloric, are all valuable remedies applicable to particular states of the stomach and system. The sulphuric is more constringing in its effects than the nitric or the hydrochloric acids—which are supposed to add qualities to the blood and affect the secretions of the liver and kidneys, and are given therefore in affections of these organs. They are all taken when diluted in the proportion of one part of acid to three of water, in the dose of from ten to twenty drops of the sulphuric in a large wine-glassful or more of water; and from twenty to sixty of the latter—which are often advantageously given in combination, in

equal proportions. They are when largely diluted grateful, and often useful also as tonics in febrile affections, given in substitute for, and in preference to the vegetable acids—or that of oranges, lemons, and the like.

CHALYBEATES.—The numerous preparations of iron, of which the sulphate, the citrate, and carbonate are the principal, are all admirable remedies of the same class:—adapted, however, more particularly to certain conditions of the blood, and particular affections—as of anæmia, hysteria, and obstructions to which the young female is more particularly liable. The countenance in these cases is tallowy and exsanguineous, and the blood is found wanting in red particles. In such cases the citrate of iron, a beautiful preparation, soluble in water or in wine, in increasing doses of from three grains to ten, two or three times a day, is a very valuable remedy. And so is the sulphate, in doses of a grain in the form of pill, two or three times a day. Or the tartrate as it exists in the steel-wine of the shops—in doses of a dessert, or table-spoonful. And lastly, I shall speak of the carbonate or rust of iron—which has proved an invaluable remedy in certain cases of neuralgia—as *tic-douloureux* and *sciatica*; and which without being able to define its operation—further than that of imparting qualities to the blood which influence the organs affected, experience proves—that in doses of from thirty grains to sixty of the powder, taken in water or syrup two or three times or oftener in the day, it has the power in some cases of arresting the pain and spasmodic attack characterizing these affections, when all other means have failed.

I have only to add, that when the preparations of iron produce pain in the head or excitement of the system—a purgative should be given, or conjoined; and if this fails to avert the effect—the quantity should be much reduced, or the remedy discontinued.

143. ARSENIC.—Among the remedies called tonic, arsenic is one of very considerable value—in small and well-regulated doses. The operation of every agent upon the system for good or for evil, is in relation to its power and quantity. Five grains of opium under certain circumstances would kill a person, and so would a pint of brandy if swallowed at a draught. But a knowledge of these facts does not prevent our giving a grain of the first, or a wine-glassful of the latter when required; nor should the knowledge of its being poisonous prohibit us from the use of arsenic—in doses commensurate with its power and operation for

good—which we know to be limited, to from a twentieth to an eighth part of a grain, two or three times a day. In such a dose, cautiously increased, and dissolved in water by the agency of the carbonate of potass, it often proves a most excellent stimulating tonic, in the debility succeeding to intermittent fever, and in certain nervous and anomalous affections, as well as in scrofula, unhealthy-looking sores, and diseases of the skin.

144. IODINE.—Iodine and its preparations are remedies of the same class, applicable to bronchocele, scrofula, certain tumours, sores, and diseases of the skin—but as I do not clearly perceive the mode of their operation, I shall say no more on the subject.

145. STIMULANTS.—Wine, brandy, and the different alcoholic beverages, stand at the summit of this class of remedies; their operation I have already explained—when on the subject of man's more proper beverage in the third chapter. It remains for me but to say, that in cold and humid weather, they may be more properly taken than at other times, to maintain the heat and excitement of the system, and as a remedy in disease when the circulating system is languid, or the system is reduced by previous excess of excitement, below the standard of health. In such cases, an occasional glass of wine will often prove a more valuable cordial than any to be procured of the apothecary. And in other cases of sudden depression, a table-spoonful or more of brandy or a glass of sherry may very advantageously be administered—with or without an equal quantity of hot water, and in combination also at times with ginger or other spice.

The carbonate of ammonia, and its solution called spirit of sal-volatile, next to alcohol and spice deserve commendation. Their influence is supposed to be expended more particularly on the nervous system, to which they are considered to impart temporary excitement. Whether the operation of ammonia be as thus supposed, or it be of a chemical character in relation to its composition on that of the blood—which I am disposed to believe, we know not; but this we know, that in certain cases of debility and defective excitement of the system, in doses of from three grains to five of the carbonate, or of the spirits of sal-volatile in doses of from twenty to forty drops in a wine-glassful of water, or camphor julep, it is a very efficient and useful remedy—and especially so in the hysterical and anomalous nervous affections to which the female is more particularly liable. And the same may be said of camphor, æther, and other remedies of the same character.

And lastly, I may observe of stimulants,—upon the same principle that we withdraw blood from the general system to reduce the amount circulating in a part thereof, we may with equal propriety, in some cases, exalt the action of the general system in others—in relief or reduction of excitement in a part thus affected. Such are the means, by which I believe mercurials operate in many cases, and are so generally useful in the treatment of inflammatory affections, independent of their operation on the secretive organs; and the means also by which wine, and stimulants in general, are, in some descriptions of fever, found so beneficial.

146. LOCAL STIMULANTS.—Under this head may be classed—blisters and other local excitants; these, however, operate upon the principle of derivation—occasioning irritation and expending excitement upon the blistered or excited surface—in relief of the organ at a distance or part more seriously affected. A mustard plaister operates in a similar way, and so does the application of the oil of turpentine, and the preparations of ammonia, though in a minor degree. The blister by the discharge it gives rise to—possesses advantages which the others do not—thus relieving the vessels of the part, and further—in some cases—divesting the blood of some acrimonious cause of irritation.

147. WARM AND COLD BATHING, SPONGING AND ABLUTIONS, are all unquestionably remedial agents of great value. The cold bath, or ablution is however more particularly applicable to the period of convalescence, as a means of imparting tone to the system, and in the preservation of health, than that of actual disease—but in some few cases to the contrary. And it will be observed—that it is not to the cold absolutely imparted to the system—but to the reaction it gives rise to, that its benefit is to be attributed. From this point of view it is obvious—that it must be cautiously administered, tempering it in all cases to the condition of the patient:—observing that, in proportion to the debility, so is the deficiency of reactive power, and the water therefore must be as proportionably warm, and period of exposure to its influence as comparatively limited. And the reverse of this—in proportion to the strength of the individual, may be the coldness of the water and period of exposure to its influence be prolonged. And the same obtains in principle equally as to the mode of its employment. A person in health may with advantage take a plunge into a cold bath, or the sea, and if strong may be permitted to swim in it for a quarter of an hour, or

longer. But a delicate person would find it better to use a tepid or a shower bath at the same temperature, or be folded in a wet sheet, with which after being rubbed for a few minutes, be well rubbed dry with towels immediately afterwards; or better than this have recourse to the shallow bath—which will presently be described.

In all cases, if the cold bath, in whatever form employed, is not followed soon after by a comfortable feeling of warmth—it should be accepted as a rule, that the remedy is uncalled for—and that in general, the warm bath might be very advantageously substituted.

The beneficial operation of cold thus employed is not limited to the surface: it first imparts tone and a healthy excitement by the reaction that follows, to the skin—and by its agency influences—indeed excites, in like manner all or most of the internal organs by continuity of surface. For the skin of the face entering the mouth, denuded of its external coat, and now called a mucous membrane, extends down the windpipe and gullet, and gives a lining to the lungs as well as to the stomach and bowels. And therefore, if judiciously employed, cold is unquestionably a most valuable remedy; and as the skin to which the application is made, has very important functions to fulfil—irrespective of its associations, to which I have just adverted,—to keep it scrupulously clean and excited by a daily ablution of the whole surface—say, on getting out of bed of a morning (if it is only by giving it a rub down with a wet sponge or towel, or by the hands, frequently dipping them in a basin of cold water)—as a means of preserving health, it cannot, I am of opinion, be too urgently enjoined.

148. THE SHALLOW BATH.—For this we are indebted to the hydropathist, and it will be found without question—the most agreeable and generally useful bath conceivable, and one indeed that should be available in every family. It consists of an ordinary tin bath, rather long, but shallower than those generally made. This being to the height of about six inches filled with warm water, and the individual being seated in it, a couple of coarse towels are thrown in, with one he well rubs his legs and body generally, and with the other an attendant in like manner rubs his back and shoulders, baling at the same time the water freely over him. After this has been continued for four or five minutes, cold water, by means of a cock at the feet, is now gradually let into the bath (or it may be as gently poured in from

a cap), and the rubbing and baling is continued all the time till the water becomes cold, and the whole body is completely immersed. The cooling process, in all cases where the individual can bear the shock, is expedited—by the attendants suddenly dashing a pailful of cold water over the head and shoulders. The person now leaves the bath, and being covered with a coarse sheet, sits down whilst he is well rubbed dry. It is now desirable, after putting on his shirt, that he should lie beneath the bed-clothes for a short time till reaction comes on, or rather till the circulation and excitement of the bath has subsided :—a practice which, I am of opinion, should be pursued whenever a bath is made use of—without reference to its description.

149. THE DRIPPING OR WET SHEET—is another useful form of cold bathing. The sheet is thick, and dripping as taken out of a pailful of cold water, and thus suddenly thrown over the head and body it imparts a pretty smart shock. The patient now seated is closely folded and well rubbed with it for a few minutes, and then with coarse towels well rubbed dry. If the patient is delicate, the sheet is wrung dry or nearly so—and thus tempered, it is unquestionably a very useful remedy, and after the use of the sitz-bath is frequently recommended by the hydropathist, and in other cases where the shallow bath is not available.

150. THE SITZ-BATH.—This is another remedy of the hydropathist in frequent use, and of much value. I have had recourse to these baths and know them to be so ! It consists of a circular tin bath of about 20 inches in diameter and 10 inches in depth. This being filled to the depth of four or five inches with cold water, the patient sits in it from three to ten minutes. With delicate persons its use is commenced with water with the chill taken from it by the addition of warm ; and again, on the contrary with others of strong reactive powers, the coldness of the water is perpetuated, by a connecting pipe opening through the side of the bath, and another of exit, allowing a continued stream through the bath during the whole period of immersion ; and which I have known to have been continued for an hour without inconvenience. This bath has proved an admirable remedy for torpid bowels : persons who have not been able to do without medicine for years, have by its use once or twice daily, found in this a perfect remedy. In leucorrhœa and other uterine affections—to which the female is so liable, it has also proved a valuable remedy. And in piles, irritability of the bladder, enlarged prostate, spermatorrhœa, and other affections of the male, it has

proved equally beneficial. And lastly, in continued headache and some other affections of the brain, it is considered a remedy also of great value.

151. **PACKING IN A WET SHEET.**—This is another method of eliciting heat, and in some cases perspiration—much used by the hydropathist; and a remedy in many cases of congestive disease of great value, as the following relation of its use in my own person well illustrates. A couple of large blankets being first laid upon a mattress on the bed, a calico sheet, well wrung out after immersion in cold water, is laid upon them; the patient quite naked, is directed now to lie down straight upon them, when he is immediately folded in the sheet, and carefully and very closely packed in the blankets, first in one and then the other, tucked around the neck and his person generally; and after these, some four or five more blankets or a thin feather bed are in like manner secured around him. And thus as a mummy he remains packed with his arms bound by his sides, for an hour or longer. In my own case after being so packed for an hour, and feeling sadly oppressed by the heat, without perspiring, in utter contempt for the remedy, which I could endure no longer, I had most of the blankets removed, when, as the heat was reduced, perspiration soon followed. And thus remaining quiet for a couple of hours longer, I now perspired abundantly, drinking occasionally a small tumblerful of cold water in support of it. At the termination of the time I got up, having myself well rubbed dry with towels, and I never remember feeling so light and buoyant as I then did, or so much benefited by any remedy. What appeared to me at the time extraordinary was—that my arms and legs, which before the packing were soft and flabby, had now become firm and doubly voluminous. A fact, strikingly portraying the utility of the remedy, and which may be readily explained, by supposing the blood previously located in and congesting the internal organs, was thus by the agency of the heat, withdrawn from the interior and distributed to the extremities and surface of the body. And if this be its influence, it is unquestionably a remedy of first-rate importance in congestive disease—irrespective of its sweating operation in purifying the blood in the treatment of gouty, cutaneous, rheumatic, and a variety of affections.

152. **TOWEL PACKING.**—With delicate persons, whose reactive powers may be deficient, the hydropathist directs—that instead of the whole person and limbs being folded in a wet sheet, that

the body only be so enveloped, by placing a wet towel beneath him and another covering the chest and abdomen—and the patient be thus packed. This they look upon as analogous to that of a person's being immersed in a wet poultice; it is in general found, after the body becomes warm, exceedingly soothing. The object in packing is to bring the blood well upon the surface, in relief of congestion of the liver, or other internal organ. It is continued for an hour or longer, and is in general followed by immersion in the shallow bath.

153. THE RAIN AND DOUCHE BATHS.—As a stimulant to a part, or to the system in general, the hydropathist has not unfrequently recourse to one or other of these baths. The rain or rather jet bath, consists as it were of a cage of perpendicular pipes of an inch in diameter, punctured with large pin-holes, into which the patient enters, when the cocks connected with the pipes (one or all as may be required) are opened, and as the pipes are connected with a reservoir ten feet above them—the water in horizontal jets spurts forth on the person from all directions around him, or is directed only to a part; and this is continued for five minutes or as long as may be required. And this conjoined with friction of a part or the whole of the body, before or after the bath, is without doubt a remedy of very useful appliance. The douche is a stream of cold water, issuing from a pipe of from one to three inches in diameter, and descending from a height of ten or twenty feet, is allowed to fall upon the shoulders and spine; or is otherwise directed to a part by a connecting pipe, and thus used in the cure of swelling or local debility of a part; in the first way it is employed in certain affections of the brain and nervous system, as palsy, or as a general stimulant in other cases. In conclusion I may say—with perfect truth, and in all sincerity of conviction—that we are greatly indebted to the hydropathist for these, and many other curative appliances—of great value in the treatment of disease. And I may add with equal sincerity, having been myself an inmate at Dr. Wilson's—that there are but few persons in delicate health, who would not be benefited by a visit to one or other of the well-conducted hydropathic establishments at Malvern, or elsewhere.

154. WARM BATHS AND POULTICES.—(See what has already been said on these subject under the head of SUDORIFICS.) The tendency of a warm bath is to increase the perspiratory secretion, to soothe and relax the system, and at the same time restore the blood to the surface and equalize the circulation. It is there-

fore more especially adapted to diseases of irritation, to febrile and inflammatory affections. In all such cases, immersion in a warm bath, at a temperature of ninety-six or seven, or heat most agreeable to the feelings of the patient, and for the period of from twenty minutes to an hour, and daily, is assuredly a remedy of great value. And with the same intentions—in acute disease, the continuous application of a warm and moist poultice, or cloths wrung out in hot water and applied in the same way to the chest or abdomen, in the inflammations of their containing organs, are remedies accessory to others of undoubted value. And lastly, in the chronic and subacute inflammation of the internal organs, a bandage wrung out in hot water and well protected with a covering of flannel, worn round the abdomen, is a very useful remedy; and the warm sea-water bath every other day, with the pure air of the coast, is a remedy also in such cases which cannot be too strongly enjoined.

155. HOT AIR AND VAPOUR BATHS.—(See what has already been said on the subject under the title of *SUDORIFICS*.) These are remedies also of great value, but in general little applicable to the treatment of febrile and inflammatory affections; but in cases of gout, rheumatism, glandular enlargement, skin diseases, and affections of a similar description, chronic, and others of a congestive character, including obesity, are of much importance. Their operation being to purify the blood from any acrimonious admixture, equalize the circulation, and relieve the system from any superabundance of fluids by the copious perspiration they occasion. In the excitement of the brain with loss of sleep, threatening insanity, the vapour, or better the lamp-bath, is an excellent remedy, in which case it should be used daily.

156. ELECTRICITY AND GALVANISM.—As the actuating motive-power of the nerves is, as I have represented—electrical, it at once speaks to every man's mind—that electricity, in some cases of disease must prove a remedial agent of much value. That it is so, there can be no question, but there are reasons nevertheless—why it should fall very far short of the general expectation on this head! For it will on reflection be perceived, that it is not to the want of electricity so much—as it is to the antecedent condition or want of power of generating it in the system, or that of imparting it by the brain and spinal marrow as it should be, that constitutes the disease. These, then, are the purposes to be fulfilled more particularly, where this remedy would appear to be indicated, which it more obviously is in cases of loss of power,

of torpor, and depression. In the first case, as of paralysis—which but too commonly is dependent upon the pressure of effused blood or serum, into the cavities of the brain or spine—it is obvious, that exciting the nerves of the limbs or part affected, can be of little avail, so long as the pressure continues to exist;—but on the removal of this, by more appropriate means, it may then prove a remedy in restoring power and energy to the part of first-rate consideration. And again, with respect to cases of torpor and depression in like manner;—if a man has a torpid liver from congestion of its blood-vessels, it is not the application of excitement to the part, but the removal of the cause, the congestive condition, that is the object to be attained. And it is the same of depression of the nervous system—so frequently dependent upon congestion of the brain or liver—or obstruction of some kind, when an active purgative dose will often do more than all the stimulants in the universe. I mention this, not in depreciation of this remedy—but to moderate the too sanguine expectation of those, who hearing me identify electricity with the nervous power of the system, would be led to suppose that it must be a remedy of universal application. And now as the fruit of my observation and experience—let me say—when and in what cases it is useful. Generally speaking then, I consider it more applicable to the treatment of local affections, than to those of general or constitutional disease. In induration and thickening of parts, and swellings *unattended* with heat or pain—the sequels of inflammation, electrical or galvanic excitement, is without doubt, a very useful remedy; and in chronic ophthalmia and slight opacity of the cornea—wherein the vessels, I may say, have become permanently dilated—the stimulus of the electric aura, imparted to the eye from an ivory point, I have seen remove all opacity and restore clearness of vision when all other means have failed. And in the swelling of joints succeeding to gout, and in chronic rheumatism, I have also seen it very beneficially employed. And the same likewise when transmitted along the course of the nerves in the treatment of chronic paralysis—whether of the upper or lower extremities. It may be useful in other cases, but in none coming under my immediate observation. In all cases of spasm, pain, or convulsion, or excitement of any kind, I hold it to be contra-indicated.

Of the mode of application, I shall only say that this must bear relation to the nervous sensibility of the patient. With respect to induration, swellings and the like—the application of sparks through the part affected for a few minutes every day,

gradually increasing them in force and length of period, is the general mode of proceeding; and again, where shocks are applied in paralysed limbs it should be carefully directed along the course of the nerves of the part both to and from their point of issue in the spine. Of course, in the case of its application to the liver or spleen—when these organs are enlarged after proper depletive means have been used, in addition to sparks, gentle shocks through the organ may be here also very advantageously conjoined.

157. CHANGE OF AIR, DIET, &c.—Hitherto I have said nothing on these subjects—but they are nevertheless remedies which cannot be insisted on too much. Persons in general expect much from remedies taken in quantities of grains and scruples—in pills and apothecaries' mixtures, and neglect those available to all in pounds, hundredweights, and tons,—insomuch that the quantity of air we breathe in the course of a few weeks amounts it is estimated even to this latter weight! And as this is a process going on all night as well as by day, it points out to us the importance of an airy, well-ventilated bed-room. With a knowledge of these facts, it can surprise no one—how a change from London to Brighton, or other inland place to the sea-coast, should so often prove beneficial, after, perhaps, all other means resorted to have accomplished but little: or on the other hand from the coast to an inland place. Change of air is associated also with change of place, change of water, change of weather, change of those around us, and change of circumstances in so many particulars—that the mind becomes thus differently impressed; cares and anxieties are thrown overboard, and a new direction is given to thought, and to the impulses of the nervous system. A change of this kind cannot therefore be too strongly recommended, in all cases of disease where the patient is not making the amendment which might reasonably be expected—and whose condition does not *absolutely* prohibit the fatigue which necessarily attends the journey. The change of air may be also accompanied by change of diet—to fish, vegetables or fruit; but my advice on this head is, in all cases, and at all times, to attend to the dictates of nature and consult the patient as to what is most agreeable to his inclinations and appetite—and give him that, whatever it may be, that he desires, with the necessary precaution annexed—that should it appear in description something very objectionable in kind—to cautiously feel the way with it—that is, give it first in very small quantity, and repeat it or not as it may be found to agree with the patient.

158. I shall conclude these remarks by observing—that there is not a more common or erroneous opinion current among nurses—than that, because persons are very weak, they must proportionately require a very nutritious diet, and thus they are plied—without appetite, to take all manner of things and at all hours of the day. So far from this being necessary—it is, generally speaking, exactly the reverse, insomuch that debility is of a general nature, and implicates the stomach in its power to digest food in an equal degree with every other organ of the body, and the appetite therefore is proportionately reduced. The diet should therefore be in accordance with the appetite—light and of easy digestion. Beef-tea, panada, an egg beaten up with hot water, with a spoonful of wine, if not contra-indicated, calf's-foot jelly or the like, given in small quantity at a time, occasionally changed, and repeated every two or three hours—are the most suitable. And as strength is gained—so will the appetite and digestive power be increased—and if nature's promptings be attended to—which should be the case on all occasions—the requirements of the system will be furnished with what is the most suitable to its condition, and the strength of the system will be as speedily restored as the nature of the case admits of.

Having explained what constitutes Congestion, Irritation, and Inflammation—the pathological condition or essence of every disease, and traced these to the operation of a vitiated or disordered condition of the blood, and to the loss in the balance of the circulation; and pointed out what were the leading indications or principles to be pursued in the treatment of disease, as well as the nature and operation of the principal remedies to be employed with these intentions; I shall now proceed to trace the operation and agency of the various causes—predisposing and exciting—remote and immediate, in disordering the blood and deranging the circulation—whereby those affections, congestion, irritation, and inflammation, severally affect or become located in the various organs of the body—developing the symptoms of, and constituting—as they may affect one or more of the organs—this disease, or the other, of the number and variety to which man is liable.

But before I proceed with these intentions, or enter upon the analysis of the symptoms and phenomena of these numerous diseases, and their treatment, I shall first treat of those two all-

prevailing affections—Dyspepsia and Nervous Derangement;—those two great bugbears of the day,—which I trust that I shall soon make it appear, require only to be clearly understood,—to be divested of their terror, and rendered amenable to very simple treatment.

CHAPTER VIII.

OF THOSE TWO ALL-PREVAILING FORMS OF ILL-HEALTH,— DYSPEPSIA AND NERVOUS DERANGEMENT.

159. **DYSPEPSIA.**—Of all the forms of derangement of health in social life, indigestion is assuredly the most frequent. All at the present day who have not literally to labour for their bread have become dyspeptics. The cause of this is simply, that, as no one can exist without food—this is not of suitable description or proportionate in quantity (it being too commonly in excess of the air and exercise taken) to the necessities of the individual. Hence, from the excess of nutriment received into the blood on the one hand, and excess of occupation of the digestive and assimilative organs on the other—engaging too much of the motor or electro-nervous power, arise the smothered combustion in process in the system, and the murky state of feelings so commonly experienced. This state, increased but too frequently by the use of stimulants and provocatives, develops other derangements, the most prominent of which is a disordered state of the stomach; and the symptoms are accordingly—indifferent appetite, torpid bowels, acidity of stomach, flatulence, head-ache, sense of *malaise*, and fulness about the region of the stomach and liver; restless, dreaming, or sleepless nights; oppressed breathing; a languid circulation, with coldness of the extremities, or otherwise of feverish irritability; languor, and disinclination to mental exertion; a foul tongue, and so forth. These symptoms, wholly or in part modified by the particular circumstances of the individual, are obviously those of that all-prevailing affection—dyspepsia, as it has been called, and which it is not to be wondered at is so seldom cured, seeing that the seat of the disease is not in the stomach, nor to be removed by staying at

home and swallowing physic, as it is so commonly thought to be; nor is it in the nervous system—another direction in which attention is usually pointed,—but in the general system and bad habits of the individual, and is there alone to be effectually combated; although it is true, that accessory agents and temporary expedients may very properly at the same time be brought to bear upon its removal; the chief of which are obviously evacuants. But the cure rests with the individual alone, in following up these temporary expedients by a more abstinent or suitable diet, and taking an increased amount of air and exercise—the *essential remedies*, and for which there can be no substitute. The coals in the grate will not burn without a sufficient supply of air; with an insufficiency, there will be little light and heat evolved, but plenty of smoke: the bellows is the remedy in this case, and air and exercise are its representatives in the former. Added to which, however, if the cause has been long in operation, change of air to the sea-coast, with warm salt-water bathing every second day—an hour or two before dinner, and subsequently as strength is gained, the tepid or cold dip—are the remedies of most value.

160. And now, as to the measures of evacuation. The remedy of most value—is calomel, which will not only remove from the bowels their foul contents, but relieve the system, by the increased secretion of the liver which it will excite, of a quantity of the hydro-carbonaceous matter (or excess of fuel in the blood), which, as bile, will be poured out into the bowels and excite them to evacuation. It will moreover fulfil other most useful purposes, by increasing the circulation in general, and the secretions in common—the urinary and perspiratory among the rest. A single grain of calomel—(a grain and a half or two grains at most, according to the age and constitution of the individual)—in combination with the same quantity of Socotrine aloes, and as much Castile soap made into a pill, and taken every night for a week or longer, or every second night if it be found too active, will in general fulfil the desired purpose very effectually. The intention of the aloes is, as a purgative, to accelerate the expulsion from the bowels of the bilious secretion poured into them by the agency of the calomel, and thereby prevent the irritation which attends the presence of acrid bile in the bowels, and thus supersede the necessity of the too common practice of following up a dose of calomel with a black draught.

161. No stimulants are in this case required, but the one named, and stimulant it is of the most general kind, seeing that

it excites the circulating powers and all the secretions. The importance and utility of calomel as a remedy in this and most diseases are, however, so great, that I must entreat the reader to lay his prejudices aside, if he have any, and read what I have said on the subject of this remedy in the last chapter.

162. More than what I have advised, in the shape of medicine, will seldom be required; but it should be conjoined with a fluid abstinent diet, as broth, beef-tea, and food of this light description till the appetite returns, abstaining also from beer and spirituous beverages. Following up these with air and exercise proportionate to the capabilities of the individual and the necessities of the case,—remembering that these alone are the essential and radical remedies to be resorted to. For anything further in the shape of remedy and treatment of this and its attendant ailments, as hypochondriasis, &c., I must refer the reader to the chapter on Disorders of the Liver and Stomach in an after page.

163. In conclusion of this subject, I must be permitted to add the following very just observations of Mr. Newnham: “Both cause and effect are generally misunderstood; the patient rests in generalities; he has a weak stomach, or his digestion is not good; or he has eaten something which has disagreed with him; and the inquiry ends here, instead of really ascertaining what is the cause of this commencement of evil; and so the time for remedial agency is suffered to pass unimproved; Nature’s apprehension of evil is entirely thrown away, till the stomach’s consciousness becomes pain, and a grand centre for the radiation of morbid action; digestion becomes more feeble, the food is not properly assimilated, the body is not adequately nourished; the blood ceases to acquire all the red particles it demands, the cerebral system is supplied by blood which is not endowed with a sufficient amount of vitality, the production of nervous energy is rendered uncertain, irregular, defective or even irritative; every function languishes; every organ is tossed from its equilibrium, and becomes less capable of supporting life; disease advances, and the system is worn out by irritation, *if not previously destroyed by ulceration of the stomach or other organ.*”

164. NERVOUS DERANGEMENT.—The next great and all-besetting bane of health at the present day, is *excess of mental employ*. In one class of society, the allurements of the press, in the shape of novels, newspapers, and periodicals of various kinds; in another, ambition, professional pursuits, and the like; and in a third, the cares and disquietudes of competition, and the various

heart-burnings of civil life, of love, and of the passions ;—these, in their various forms and combinations are working a great amount of wretchedness in the shape of *dyspeptic and nervous* ailments, diseases of the *heart*, and numerous other affections, and overspreading the land with lunatic asylums. In the rising generation, too early education, confinement, and close application, are laying the foundation of much after-suffering, in developing over-susceptibility of mind and weakly constitutions,—the rudimentary conditions of consumption, scrofulous disease, and mental aberration.

165. The derangements of health, founded upon the above causes, are primarily dyspeptic, and subsequently nervous or complicated. The dyspeptic class we have already glanced at ; the nervous will be now the object of our consideration ; and these are often the most prominent of the two. As the subjects of this class of ailments, instead of taking too much sustenance, are but too often negligent of their meals, and as the stomach is in antagonism to the brain as far as the mental functions are concerned,—so, from this cause, the want of sufficient sustaining power and stomach-employ, the mental faculties are so much in a state of preponderant excitement, that there is a constant craving for employment, with but little aptitude for the necessary application to successful result. Thus the restlessness of pursuit induces such persons to be regardless of the ordinary enjoyments of life, and a comfortable meal ; their mind at the same time is proportionately susceptible and irritable. From this cause, when the head is laid upon the pillow, but little sleep is to be obtained ; the head too is hot, and sometimes painful, and the bowels torpid ; such persons also rise in the morning giddy, and but little refreshed. It is unnecessary for me to say more than that the dyspeptic symptoms will be more or less prominent, according to the habits of the individual in relation to the amount and kind of food, beverage, and exercise taken, as well as to the purity of the air respired, the temperament and constitution of the individual, and other circumstances of the like nature. The symptoms being thus understood, the treatment is obvious. A devotion to air, exercise, and proper nutriment, is indispensable—in opposition to mental employ, which must be at once thrown aside, or perturbation of any kind. Attention must at the same time be paid to the existing derangements of the digestive organs ;—exciting the bowels by purgatives, as the pills of calomel and aloes before mentioned—in antagonism to the head, being

however in general, all that is necessary in this way :—or if anything further is required—a month's visit, to one of the hydropathic establishments at a distance will be about the best, or if this be objected to, to the sea-coast.

166. A REMEDY FOR MENTAL ANXIETY.—To these observations I have one other to add, namely, that the restless, sleepless and wretched condition which so often succeeds to anxiety of mind, or perturbation, or too active study, or other cause of the brain's temporary excitement, is best remedied by a large but not immoderate dose of opium. A grain, or a grain and a half, on going to bed, will often act as a charm in these cases, affording immediate and permanent relief; so much so, that if it were more frequently had recourse to, we should hear of few of the melancholy cases of suicide which so frequently occur, or of insanity, which not unfrequently follows such a condition. But if the cause be one of more lengthened operation, half a grain or more of opium may be taken every night—and if combined with a grain of calomel, which will at the same time excite the secretion of the liver—the effect will be much improved: and if further conjoined with change of air and warm bathing—as advised under the head of *Dyspepsia*—with which nervous derangement is so constantly associated, the greatest possible benefit may be expected.

167. I shall next, in continuation of the subject of nervous derangement, proceed in the following chapter with my analysis of the diseases of the brain and nervous system.

CHAPTER IX.

ON THE DISEASES OF THE BRAIN AND NERVOUS SYSTEM;
AND THEIR CONSEQUENCES—APOPLEXY, PALSY, INSANITY,
DISEASE OF THE HEART, CONVULSIONS, SPASM, &c.

168. THE NUMBER AND CHARACTER OF DISEASES ORIGINATING IN EXCESS OF MENTAL EXCITEMENT.—The primary and most frequent kind of derangement of health—originating in excess of mental employ, perturbation, and excitement, I have already glanced at, as it exists in its most simple form. I shall now

trace the further progress of this neglected ailment, in developing a series of disorders of the most formidable description. The income of electro-nervous power, I repeat, is at all times a limited one, fluctuating, though necessarily, with the health. Excess of expenditure and appropriation of nervous power by the brain—by its undue employment, and preternatural excitement, will occasion therefore torpor, or defective excitement of the stomach and associated organs:—the fund of power for the excitement of all the functions being, as I have elsewhere pointed out, a conjoint income; and thus may these organs be said to be in antagonism with each other—that is, the brain with the stomach. I mention the stomach in particular, it being the central organ of the body and the representative of the rest. The simple derangement or torpor of the stomach and associated organs is all that I have yet noticed as flowing from this cause; but it must now be observed, that this is but the shadow of the substance of the evils that follow undue excitement of the brain. The excitement of an organ, whatever that organ may be, gives rise to, or is productive of, a determination of blood to, or an exalted state of the circulation in, that part. Hence, if the brain, or any part of it, be kept in a constant state of action or excitement, though but of a passive character, as in continued thought—more particularly if that thought be of an emotional kind, and confined to one subject—as in the case of grief, anxiety, unrequited love; as well as by intense application, ambition, or other active mental excitement,—congestion of the blood-vessels, or accumulation of blood in the part thus preternaturally exercised, will of necessity ensue. This will impede the circulation through the part, and disorder or weaken its function. And more, if the cause be allowed to continue in operation, and the congestion maintained, exudation will follow; that is, serum, or the aqueous portion of the blood, will be effused or transude through the coats of the congested vessels, and palsy or apoplexy will follow, if one or other of these affections do not more immediately ensue, from the direct pressure of the congested vessels on the part, or from the rupture of these vessels and effusion of blood which follows it. Or in other cases, where predisposition exists, and effusion does not take place, or in certain conditions of idiosyncrasy, or states of the blood, sub-acute inflammation or irritation, with mental delusion, or the excitement of insanity, will be the result, or spasmodic fits, or convulsions will follow. And again, should these evils not occur, others of equal magnitude will follow, flowing out of the same

cause ; and to these I shall now direct attention. To congestion of the brain, and torpor of the assimilating and secreting organs, which are coincident in these cases, disorder in the constitution of the blood must of necessity succeed,—developing immediately, reflectively, or remotely, a host of complications and ailments, as disease of the heart, lungs, liver, or kidneys, as well as gout and a variety of neuralgic affections—that is, painful or spasmodic affections of the nerves. The nutritive and structural endowments of the brain will also from this cause—the blood's unhealthy condition, be diseased, perturbing thereby the mind's manifestations : hence, in illustration of this, may be mentioned, that when the liver is torpid, and does not divest the blood of certain excrementitious particles—the elementary constituents of bile—irritability of mind and despondency notoriously ensue. Those mentioned are but a few of the disorders, which, being more readily traced, out of the multitude caused by this simple but most pernicious practice—immoderate or too long continued mental excitement, I shall now attempt the explanation of.

169. DISEASES OF THE HEART.—And first, with respect to the heart. All persons must be sensible of the effect of mental excitement upon this organ. The bounding of the heart in the chest, the throbbing of the arteries in the head, which attend anger and some other causes of excitement ; and on the contrary, the sense of fainting and withering of the heart, as sometimes expressed, which attend fright and some other causes of mental perturbation, will of themselves occur to every mind as exemplifications of the capability of mental impressions to derange at once and immediately the heart's action ; and to an extent in some instances we read of, as in sudden and extreme joy or fright, of inducing immediate death*. And acknowledging this, they will readily apprehend how a minor degree of the same or other cause of mental disquietude or excitement, operating for a length-

* The varied examples of the influence of the mind upon the body have been thus prettily detailed by Mr. Newnham in his work on this subject :—
 “The suffusion of the countenance in blushing ; the shrunk features and pale goose-skin produced by alarm ; the chattering of the teeth under fear ; the increase of various secretions from mental emotions—as of the tears in sorrow, or of the bile in anger ; the palpitation of the heart under almost every sudden emotion ; the short and quickened breathing of expectation ; the oppressed and stifled respiration of intense and harrowing emotion ; the arrest and almost imperceptible action of breathless anxiety and expectancy ; the expression of the muscles of the countenance alternately lighted up with joy, or worn with anxiety and suffering, and the thousand varied emotions they are capable of

ened period, may, as it assuredly will, produce slow but permanent derangement of the heart's function, and eventually structural disease also*. The heart, it will be remembered, is a very complex organ, consisting of four distinct parts, each having to contract and dilate in a regular order of succession, not less than five thousand times every hour of our existence; and to this must be added, the duty to be performed by its several valves, in opening and closing the doors against the blood's admission or retrogression an equal number of times. These facts being considered, no doubt can enter the mind of any man of the consequences being as I have stated;—excluding for the present other causes of the heart's derangement, arising out of the blood's deterioration, from the disorder of the assimilating and purifying organs, which are coincident, and their reflected operation as well—giving rise perhaps to ossification of the valves and angina pectoris. And thus spasm of the heart, sense of oppression, palpitation, an intermittent pulse, and a variety of other derangements of the heart's function, may be readily accounted for; and which, I repeat, if allowed to continue, will assuredly develop structural disorder or disease, either of the valves or the cavities, as a necessary consequence; and not of these only, but will involve the lungs in disease also. The circulation of the blood through these organs, which are immediately connected and associated in function with the heart, being by the affection of the latter more especially impeded—pulmonary apoplexy and chronic inflammation of the air-tubes with asthma will follow, or inflammation of the membranes enveloping the lungs, and dropsical effusion into the chest, or pericardium—the heart-bag, will take place. Enough has now been said of affections of the heart, arising out of this cause, to render them understood: for what I have further to say on the subject of affections of the lungs, liver, and kidneys, I must refer the reader to the future chapters upon the diseases of these organs respectively, as well as for the subjects of gout and neuralgia in connexion with it.

expressing; the plump portliness of the man at ease, and the extreme thinness of the victim of deep disappointment or of any long-continued devouring passion. So that to be dried with grief, to be devoured by remorse, to be consumed by sorrow, are not only common expressions, but literal representations of actual bodily conditions, dependent on mental emotion and moral influences."

* In exemplification I may adduce the case of the late talented Lord Macaulay—who has just fallen a victim to disease of the heart, occasioned without doubt by excess of mental employ.

170. APOPLEXY AND PALSY.—Returning to the affections of the brain, I must now enlarge upon the subject of apoplexy and palsy. I have already explained how congestion or preternatural distension of the veins of the brain, of the whole or a part of it, may ensue upon disquietude or excess of mental employ, and terminate either in sudden deprivation of the senses,—the function of the brain by oppression ceasing, as in apoplexy ;—or how in a more gradual manner may effusion of the more fluid part of the blood take place from the congested vessels, and develop the same affection, or the minor one of palsy—characterized by privation of the power of volition, or of sensation—affecting one or more of the special organs of sense, as of sight, hearing, smell, or taste, without implicating the whole as in apoplexy ; or otherwise affecting the integuments or muscles of the face only, or one or more of the limbs of the body, though in general two—the arm and leg of the same side. These effects are determined by and dependent upon the situation of the pressure of the effused fluid, and the portion of brain or spinal marrow—its prolongation affected thereby and more immediately connected with the nerves of the parts paralysed. The same paralytic affection moreover, in general succeeds to or accompanies the attack of apoplexy—which is indeed palsy of a more general description. And when occasioned, which in severe cases it mostly is, by rupture of blood-vessels, the pressure of the effused blood on the brain paralyses the respiratory function and action of the heart, and death not unfrequently ensues.

171. THE APOPLEXY OF THE FAT AND PLETHORIC.—Another cause of these affections is one of a totally opposite character to that previously assigned. The want of mental excitement in the majority of these cases being the primary cause of the disease, which in this case occurs in persons whose time, or rather the functions of whose system are almost exclusively and totally engaged in the digestion and assimilation of food. And who accordingly generate more blood than is compatible with the necessities of the system and its free circulation ; and whose muscular power and fibre in general being weakened withal by the want of sufficient exercise—the vessels of the brain, thus weakened and engorged, give way, and apoplexy ensues. Nature, in the majority of these cases, attempts for a while her own relief, or the prevention of mischief from these causes of super-nutrition, by the development of fat. This, however, has its limits for good, its excess becoming a source of further weakness and de-

rangement—inasmuch as the accumulation of fat taking place about the heart, kidneys, and other organs occupying the cavities of the chest and abdomen, prevents the descent of the diaphragm and the full expansion of the lungs, whereby the aëration and vitalization of the blood are proportionately impeded. And hence, from this cause and the distension of the blood-vessels of the brain, the constant tendency to sleep by which such persons are all day long possessed ; and more particularly so after a meal, when not only will addition be made by nutritive absorption to the fulness of the blood-vessels, but the distension of the stomach will still further diminish the descent of the diaphragm and the expansion of the chest. “ Laugh and grow fat ” is a common expression. Great laughers in most cases having nothing much better to do ; but the penalty of a man’s indolence and waste of his talents too frequently awaits him in an attack of apoplexy, asthma, or something as bad—so that great laughers are not much to be envied after all.

172. THE ATTACK OF PALSY.—Palsy, as I before observed, often attends, or becomes the sequel of apoplectic seizure ; both being the same in kind, but varied in the extent of their operation. Thus palsy—the minor affection, succeeds the apoplectic seizure, from the absorption, consequent on the treatment pursued, of a portion of the blood or fluid effused, which had overwhelmed the senses also in the first instance ; or the primary mischief may be of a more limited kind, and palsy—or privation of muscular power, without apoplectic seizure or deprivation of the entire senses, may take place, of which the subjoined case offers a common example. A lady, who had suffered for some time by a sense of general weakness and oppression, sleepiness by day, and torpid bowels ; whose menstrual period of life had not long terminated, and who had been for some time the subject of anxiety, accompanied her daughter to the terminus at Paddington, on the return of the latter into the country. Soon after her arrival there, she was suddenly seized with an indescribable feeling of general weakness, requiring her to be immediately put into a cab and sent home ; where on arrival, and on being taken out of the coach, it was found that her right arm and leg were completely palsied ; she was perfectly conscious during the whole of the time, and her senses were entire. The attack in this case was developed by the excitement of the brain connected with hurrying to the station in time, and the emotions of parting with her daughter, operating upon a system predisposed to the attack by plethora and anxiety.

173. SYMPTOMS OF APPROACHING APOPLEXY. — Apoplectic seizure seldom occurs, I believe, without some premonitory indication: but I fear the symptoms of premonition are frequently not rightly understood, and the warning voice of Nature is accordingly too often neglected. Two cases, preceded by cataract, have lately come under my notice. In these cases of obscurity and thickening in the coat of the lens of the eye, did not the cause consist in the congestive condition of the blood-vessels of the brain? In one case it was obviously so, the outer coat of the eye being also bloodshot. In another case, obscurity and weakness of sight and deafness had for some months preceded the attack, and were doubtless dependent upon the same cause—congestion of the blood-vessels of the brain about the roots and origin of the nerves of those organs of sense. I was myself for a long time extremely deaf: an attack of fever, which supervened upon exposure to the sun, and general derangement of the system, induced me to be bled, and apply twenty leeches also to the back of my head, when on recovering from fever, my hearing was restored*. Numbness and loss of feeling in the extremities of the fingers, is another acknowledged indication. Loss of the sense of taste and of smelling, or of the memory, stammering and difficulty of articulation, as well as sleepiness by day, and sense of weight and fulness of the head, vertigo or giddiness, and in some cases oppression of breathing, paucity of urine, and torpid bowels—the latter, too, being but little amenable to purgative medicines—are all symptoms of congestion of the brain and premonitory of apoplexy, which should in no case be neglected, and especially by the female at that period when it ceases to be with her after the manner of her sex, and by all other persons of sedentary occupation.

174. TREATMENT OF APOPLEXY AND PALSY.—The symptoms enumerated all clearly manifest oppression of the brain and depreciation of the function of that portion of it more especially

* The same thing has again occurred to me in a still more marked degree. Some months ago I was attacked by inflammation of the bladder; this occasioned me to be cupped five several times, and to lose upon an average five ounces of blood at each operation, at intervals of a fortnight; the result has been that I not only hear much better than I did before the bleeding, but find my mind clearer; and I have been relieved from a tottering gait, which I had not the power for the last year or two to control; and more, I feel my general health also much improved. That I cannot help thinking that deafness is attributable much more frequently to congestion of the brain, than is *generally* supposed.

connected with the part paralysed. I shall now enter upon the treatment of apoplexy and palsy. The cause of these affections—namely, congestion of the brain, I have pointed out to be of two kinds—either as a consequence of super-nutrition of the system, or of a preternatural determination of blood to the brain by undue excitement,—mental in most cases; undue exposure to the sun's rays will, however, produce the same results. Mechanical causes of cerebral excitement, as spiculæ of bone, or preternatural growth of any kind in the substance of the brain, rather develop epilepsy or convulsions; though the latter affections are doubtless more frequently occasioned by the reflex operation of visceral irritation, as we see exemplified by worms in the intestines and in dentition. Nor do I here take into account the apoplectic condition which attends morbid conditions of the blood, as in cholera and congestive fever—producing oppression of the brain, coma, and convulsions, which will be more properly noticed when treating upon those subjects. Referring to the causes of apoplexy previously assigned, the treatment necessarily bears reference to the particular cause which has provoked the attack. The first—super-nutrition, obviously calls for bleeding, for the removal of both cause and effect,—the surplus quantity of blood, on the one hand, which has occasioned the rupture of the blood-vessel, or of the effusion from distension of these vessels, and, on the other hand, in aid of the absorption of either. Magendie's experiments, I here repeat, having proved that absorption, whether effected by the imbibition of the veins, or of the absorbent vessels—the drains, as I have elsewhere called them—is carried on in all cases in the inverse ratio to the distension of the blood-vessels. Bleeding in such cases, with an active purge of calomel and jalap to secure the system from any irritation which might be in operation from this quarter, and produce a determination of blood and excitement to the bowels, in relief of the brain; with abstinence from fluids to as great an extent as possible, and warm fluids in particular, and a less nourishing diet, are assuredly the chief remedies; and if the general health has been pretty good up to the time of attack, are all that would appear essentially called for. The bleeding, however, to be successful after the first operation, must be in moderate quantity at a time, and at short intervals, so as to produce no shock upon the restorative powers of the system; that is, depression of the heart's function, which, be it remembered, is not only that of a forcing-pump, but of a sucking-pump also—propelling the blood

from one of its cavities by its contraction, and drawing it back again from the veins into another by its dilatation—which is as much an active effort of the heart as its contraction. And as this is the efficient and, I believe, only active absorbing power of the system, it is obvious that enfeebling this will, instead of aiding in the removal of congestion, be productive of, or conducive to its taking place where it did not previously exist: but upon this important subject I must refer the reader to the previous chapter on blood-letting. In this particular instance of overwhelming oppression, in the primary condition of attack, a large bleeding may be advised, which at a later period would be very improper; taking from sixteen to thirty ounces, and repeating it after the bowels have been relieved if necessary. For reasons which will be obvious, the head and shoulders of the patient should be supported high above the rest of the body in bed, both to favour the blood's return from the brain, and to diminish its ascent thereto; the head also should be kept cool by enveloping it in a wet towel. In addition to these means, abstinence from all stimuli, physical and mental, should be adopted, till the patient can get about again; though, in some few cases, the immediate shock upon the system may occasion the necessity of some restorative or moderate stimulus being had recourse to; this, however, can be but for a temporary purpose, namely, that of reanimating the heart when motion has all but ceased, and when adopted should be used conjointly with the depletive and more permanently beneficial remedies. With this intention, hot flannels may be applied to the chest, and the feet and legs enveloped in hot mustard poultices; at the same time a spoonful of hot brandy-and-water, or thirty drops of sal volatile, may be administered; or better, if practicable, a large clyster of hot water, with three table-spoonfuls of spirit of turpentine and one of common salt, may be thrown up the bowels. These are remedies applicable only to the period of invasion; but in cases in which the individual has been habituated to drink freely of wine or other stimulating beverage, a continuance of the same to a moderate extent may be required throughout the treatment, as, from what I have before said, it must be obvious that the heart's power must be maintained. Should the evacuations produced by the purgative be dark and unhealthy, a pill of calomel and aloes (a grain and a half of each) may be continued night and morning; or if the bowels are very torpid, which they frequently are in these cases, a draught, consisting of two ounces of senna

tea, with a tea-spoonful of Epsom salts, may be conjoined, till the evacuations have a more healthy appearance; and the bowels may be subsequently kept open with advantage by continuing one of the pills every night, which may supersede the necessity of further bleeding when a certain amount of amendment has taken place; but the bleeding nevertheless is not to be too hastily omitted, for reasons hereafter to be explained.

175. THE TREATMENT MODIFIED BY THE CAUSE OF ATTACK.—Should, on the other hand, undue mental excitement, developing congestion or exudation, have been the cause of attack, a treatment modified by the different circumstances of the case should be adopted; the congestion being of a more local character, or less in degree, or operating upon a system otherwise than full, bleeding in smaller quantity, and at longer intervals, should be practised, or cupping or leeches be preferred. And in substitute for bleeding, more should be done upon the principle of derivation in these cases—which being developed by excitement, excitement it should be our object to transfer. This may be done by the irritation of a blister applied to the nape of the neck, or between the shoulders; and by exciting the secretions of the liver and bowels in a more eminent degree by the pills of calomel and aloes, which are moreover often especially indicated by the state of torpor and derangement of these organs, which are so frequently concomitant, and in some respects a cause of the disease itself. And as the secretions of the skin and kidneys, from the same causes, may be disordered also or be defective in quantity—they may in turn be often excited and increased with advantage,—the former by the agency of the hot-air or lamp-bath, and the latter by a varied course of diuretics.

176. FURTHER GENERAL TREATMENT.—If the paralytic affection which so generally succeeds the apoplectic seizure is not removed by the means already advised and steadily carried out, it will be proper to try the effect of gentle salivation; for which purpose a grain of calomel may be taken night and morning till a free but moderate flow of saliva is induced. If this does not fulfil the purpose, a succession of blisters should be applied to the spine, alternately to the sacrum (or bottom of the backbone) and to the nape of the neck, if the lower extremity be palsied; or to between the shoulders and back of the head if the upper extremities are affected. The limbs affected in all cases should be well rubbed with an embrocation consisting of equal parts of the oil of turpentine and spirit of ammonia, shampooed and exercised,

twice or more frequently in the day. Should these means prove unavailing, they may be followed up by a trial of the strychnine, which experience proves to be a useful remedy, in doses of a twentieth part of a grain two or three times a day, cautiously increasing the dose till a quarter of a grain is taken daily; and with this may be conjoined the douche bath, or stream of cold water poured for a few minutes daily upon the head and along the course of the spine; or electricity, in gentle shocks along the course of the nerves of the limbs affected, and sparks may be applied also to the muscles, as I have in several cases seen successfully practised. In addition, however, to all these means, I must again mention an occasional moderate bleeding—not to reduce the powers of the system in any way, but to aid in that of absorption—a clot or the pressure of fluid still being the cause of the symptoms, unless they are occasioned by some positive structural alteration—in which case no harm can result from this remedy if judiciously practised; conjoining with it as a stimulant on the heart and absorbent system, a grain of calomel every other night, and improving the general health by early rising, air, exercise, and attention to diet.

177. NERVOUS IRRITATION, SPASM, &c.—I shall now trace the influence of excitement of the brain and excess of mental employ in developing another class of affections of a perfectly opposite character to that of palsy, though often terminating in that affection. The effect in this case being irritation, or exalted action of the part of the brain affected,—manifested by neuralgia—or augmented sensibility amounting to pain, or spasm of the part to which, by nervous communication, the portion of the brain affected distributes power, as in that painfully acute spasmodic affection of the face and orbit called *tic-douloureux*. *Sciatica* is another painful affection of the same kind, seated, however, in general in the spine, if it be not in the membranous sheath or covering of the nerve itself—extending with it from the spinal marrow down the hip and thigh—and affecting in this case the nerves of sensation only: Whereas in locked jaw, the seat of which affection is in the summit of the spinal marrow, the part affected is more particularly that from which the nerves of volition arise,—involving therefore probably the cerebellum also, and muscular rigidity and involuntary contraction of the muscles—or spasms are accordingly developed. I assume that in all these causes, congestion, from whatever cause occasioned, has developed an exalted momentum of blood in the part—increased

capillary action, but not to the extent in general of inducing inflammation—unless it is of the subacute kind—but a condition bordering thereon, which I have denominated *irritation*. In locked jaw, however, inflammation, absolutely, I believe, is more frequently developed.

178. *INSANITY*.—Having explained what I believe to be the morbid condition of the parts attending those cases of irritation adduced, I will now proceed to describe another affection of the brain based upon inflammation or irritation of a part of it or its appendages—developing mental delusion or insanity, and implicating in these cases the hemispherical or mental portion of the brain more particularly, though not always exclusively so. The excitement of rage, or immoderate anger, a species of temporary insanity, offers at once a simple illustration of this condition of irritation: here the mental emotion has exalted the circulation of the part directly and immediately, as is evinced by the excited countenance, and throbbing of the temples, to a degree indicating a condition bordering on inflammation; and its consequences, namely, perverted sensation and emotion, take place. And in the case first adverted to, insane functional manifestation, or delusion, follows.

179. On the subject of *insanity* and its *treatment* I shall now offer my opinion. In a former chapter I observed, that a timely dose of opium would in many cases of mental disquietude avert this disease. It is obvious that I had in view the premonitory stage of excited intellect, when no positive mental delusion on the part of the individual had become manifest, when the circulation in the organ or part of the brain affected was in the condition of simple *irritation*—that is, before the circulation in the part had become so enfeebled as to have lapsed into positive inflammation—though of the sub-acute kind, which becomes the sequel of neglect in all cases, as the subjoined report most irrefragably demonstrates*. With the facts and explanations before

* In the Medico-Chirurgical Transactions, in a paper on the Pathology of Mental Diseases by Dr. Webster, is a "Report of thirty-six Dissections of Insane Patients made a short time before at Bethlem Hospital, making, with the seventy-two previously recorded, one hundred and eight autopsies." According to this report, some diseased alteration of structure, more or less evident in the brain and its membranes, was observed in all the thirty-six cases. We have Mr. Lawrence's voucher for their accuracy. "In thirty-three the pia mater was infiltrated; in thirty there was turgidity of the blood-vessels of the brain and its membranes; in twenty-six, effusion of water had taken

us, the indications of treatment are obvious; that is, primarily to subdue irritation; secondarily to overcome the effect of its continued operation and extended influence—namely, inflammation; or their intermediate conditions. Should, therefore, the dose of opium recommended in the first instance fail in affording permanent relief, which must be the case if the exciting cause—the mental disquietude or perturbation—continues in operation, it will be desirable to continue the opiate, a grain of solid opium every night, or half a grain two or three times a day, or an equivalent quantity of laudanum, that is, fifteen drops; or three grains of the extract of henbane in a pill as frequently may be substituted. In addition to this, a warm bath at an agreeable temperature, for half an hour or longer every evening, will be an excellent expedient; immersing the head, or having the warm water of the bath poured over it from a jug during the immersion of the body, is also much to be recommended. Preceding this, however, should there be pain in the head, and especially if the opiate do not afford relief, by the application of a dozen or more leeches to the temples, or behind the ears, or by cupping and taking from eight to sixteen ounces of blood from the shoulders, according to the age and constitution of the patient. Or if there be much heat about the head or intolerance of light, and throbbing in the head and temples*, a bleeding from the arm at once to faintness, if the patient's constitutional powers do not prohibit

place in the ventricles; in sixteen, thickening and opacity of the arachnoid; in twelve, fluid at the base of the brain; in nine, the substance of the brain was altered; in eight, patches of bloody points appeared on the medullary surfaces; in five, the medullary or cortical substance was altered in colour to that of pink or a rosy tint; in four, blood was effused in the brain. Thirty cases exhibited disease also of the chest, and twelve of the abdominal organs.—Of the one hundred and eight cases, there was infiltration of the pia mater in ninety-two; turgidity of the blood-vessels in eighty-nine; fluid in the ventricles in sixty-seven; effusion at the base of the brain in thirty-nine; thickening of the arachnoid in thirty-two; bloody points on the cut surface of the medullary substance in twenty-seven; blood effused within the cranium in seventeen.”

* Dr. Clutterbuck in his work on Inflammation observes that “in the diseases of infants, if upon grasping the head between our hands we are made sensible of an unusual degree of heat within, it is a ground for suspecting at least inflammation to be going on in the brain or its membranes, or both; and should this be accompanied by increased pulsation of the arteries about the head, and still more, if there be observed any disturbance of the cerebral functions, there is hardly room for doubt; and the same in regard to other parts, that is, where there are increased heat and pulsation in the part, there does inflammation exist.”

it, may be very properly recommended ; in either case giving the patient also an active purgative—three or four grains of calomel in a pill, and following this up two hours after with half a drachm of jalap powder with as much cream of tartar ; and if this fails to operate effectually—the bowels in these cases being in general very torpid—by a mixture of salts and senna tea every two hours till the desired effect is fulfilled. And continuing this mixture two or three times a day afterwards, or the opiate—whichever of the two may appear to afford the greatest amount of relief ; which will necessarily depend upon, and at the same time portray, the real character of the disease—whether it exist in the stage of irritation alone, or has extended beyond this into the severer affection of inflammation, when the continued application of cold to the head, by an ice-cap (that is, a bladder half-filled with ice), will also be an excellent remedy. It is impossible, therefore, to define the precise mode of treatment required : in some cases the two may be combined, the opiate by night, and the purgative by day : this must necessarily depend upon the stage of affection and the condition of the affected organ, as well as upon the constitution of the patient, the nature of the exciting cause, and the particular circumstances of the case. I must here, however, observe, that the disease may be based upon or connected with a state of general debility ; in which case the non-exciting tonics—as the cinchona bark and the mineral acids—will be very necessary remedies in conjunction with the opiate and local remedies—cold applications to the head as one of them, and a substantial diet. A blister on the back of the neck, or between the shoulders, will be another very useful expedient in many cases ; and if the disease has progressed to the second stage, or borders upon it, much benefit may be derived from the hot-air or vapour-bath, to the extent of producing copious perspiration. If there be much excitement, to the purgative mixture may be advantageously added one grain of emetic tartar, so that the latter be given in doses of a quarter of a grain every two or three hours, or quantity sufficient to keep the stomach nauseated.

180. Hysterical breathing or other spasmodic affection of the muscles of the tongue, the voice, or those muscles associated in swallowing (circumstances concomitant with the mental excitement, and connected with the irritation in the brain involving that portion of it from which the nerves of these organs arise—the medulla oblongata and summit of the spinal marrow), in-

ducing the patient to protrude his tongue and utter discordant sounds, or occasioning a difficulty of swallowing or breathing. If these symptoms are not to be relieved by a full dose of opium—which should be administered if necessary,—they exhibit the more advanced condition of inflammation—when cupping or leeching the back of the head occasionally, and a blister kept open between the shoulders or behind the ears, are the proper remedies; following these up by the insertion of a seton at the summit of the neck. Spasms of the arms and clenching of the hands are dependent also upon the same cause, and are to be treated in the same way.

181. MALARIA AS A CAUSE OF MENTAL EXCITEMENT—*TIC DOULOUREUX*, &c.—And now to the causes enumerated, I must add another, an exciting one, I believe, of much more frequent operation than is generally imagined; and that is Malaria—a debilitating cause, developing congestion and irritation in a part of the brain in which predisposition existed, through anxiety of mind, perturbation, or excess of its employment. Analogous to the excitement which here becomes manifest, is the ophthalmia or inflammation of the eye, which in India I have so often seen developed by the same agency, and from which, too, our troops suffered so much in Egypt. The characteristic symptoms attending this cause of the disease, and the brain's excitement, will be, as in cases of fever, developed by the same agency, and that of ophthalmia,—periods of intermission or exacerbation in the pain in the head, or state of mental excitement, or in the accompanying febrile condition, which, although obscure, is nevertheless present. The treatment of such a case is obviously that of intermittent, or rather of remittent fever with local inflammation,—on which subject, as well as the ordinary forms of brain fever—that is, of fever attended with irritation or inflammation of the membranes of the brain,—I must refer my reader to the chapter on those subjects.

182. If to what I have now said on the operation of malaria in developing excitement of the brain, be added, the explanation I have before given of *tic douloureux*, spasm, and other forms of neuralgia—or nervous irritation, it is obvious that these may be, and in reality often are, developed by the agency of the same cause of excitement, and that they severally call for the same treatment; in which cases I may observe, in addition to local bleeding, the vapour-bath and appliances of the like description in relation to the local affection—the sulphate of quinine would

appear, as in fever developed by the same agency, the most appropriate remedy—and in practice this is found to be the most successful—given, as in fever, in pretty ample doses—that is to say, three grains three or four times or oftener in the day.

183. To these observations, I shall now add the following cases and observations in illustration of my views. They were submitted to the public in the pages of the 'London Medical Gazette,' in November 1841, under the title of "Excited Intellect and Mental Delusion," and addressed to the editor:—"The subject of insanity is one of great interest, and, in these days of increasing frequency of the disease, of great public importance; which I trust, sir, will plead my apology for addressing you on the present occasion, with a view of drawing the attention of the profession to the indications of treatment in the like description of cases, and to the simple means successfully pursued in a case which came a short time ago under my observation; and with the view, also, of directing the attention of the public to the importance of an early attention to the progression of the symptoms of an excited intellect—the parent and precursor of insanity—when the disease may be averted, I believe, by very simple means, if carried into timely practice.—Forester (a man condemned to a prison for shooting at a policeman, as recorded in the daily papers at the time this was published) was said to be an experimental chemist of considerable talent and ingenuity—and who, some months before, had secluded himself from society, had locked and barred himself up for the purpose of carrying on his experiments, and carried loaded pistols about his person for his protection; from which it is evident that he was then the subject of an excited imagination, as well as of such gross delusion, that he was unquestionably of unsound mind, and as such should have been treated by his friends at the time."

184. HOW INSANITY BECOMES DEVELOPED.—The above statement proves to us that the man's mind was devotedly intent, or abstracted, upon some purpose connected with his experiments and his seclusion, and which had produced the usual effects of too intense application of the mind—cerebral excitement, and its insane manifestation, delusion. The effect which ordinarily ensues upon over-excitement of an organ is determination of blood to the part; and, the organ here excited being the brain, arterial excitement had become developed in that portion of it in which the faculty exercised resided—or in other words—irritation or subacute inflammation in the part had ensued—

and thus arose the symptoms and their progression—an over-susceptible and excited imagination, terminating in delusion.

185. "Determination of blood to the head, terminating in insanity, is a common effect of intense excitement of the mind, whether gradually or suddenly induced. Cases of sudden invasion of insanity from extreme joy or fright, are of frequent occurrence; and madness from unrequited love, or religious fanaticism, are not less so; and that these are the result of determination of blood, developing arterial excitement of the part, is, I am of opinion, clearly manifest by the excitement portrayed in rage, and the delusion evinced in ordinary cases of fever with cerebral determination—or brain fever, as it is commonly called.

186. "The insanity of Forester, and of the very talented Mr. Irving, the founder of the Irvingites, are instances of a parallel description: and such cases, if timely treated accordingly—as physical ailments or inflammatory conditions of the brain—are, I believe, as readily curable as other inflammatory affections of the organs of life; and nearly so as the ordinary delusions of fever. But, like other inflammations of a like organic description, they are not so when permitted to become deeply rooted or chronic, when structural derangement—softening of the brain, or other disorganizing process—becomes established in the part, and its consequence paralysis, or confirmed lunacy, follows.

187. "The inflammation which attends fever when the head is affected, is in the membranes of the brain principally, and hence the pain of the head which attends it; but pain, I believe, is little felt when the substance of the brain is affected, further than by the implication of its membranes; so that we must not wait for pain being complained of, as an indication of irritation, or determination of blood to the brain, nor expect to find an excited state of the general circulation, as evinced by the pulse: on the contrary, I believe, the pulse will more frequently be found weakly, irritable, or oppressed. Giddiness of head; deafness, or loss of memory; moroseness, waspishness, or irritability of temper, and sleeplessness at night; a contracted pupil, intolerance of light, heat of the scalp, constipated bowels, and defective secretion of urine, are its more frequent concomitants.

188. "The case is one of local inflammation, when fully developed, and is confined, we may suppose, in monomania, to a very limited portion of the brain; and which it is obvious we can reach or but slightly influence by our remedies, like most other organic inflammations, only through the medium of the

system at large. Hence bleeding, one of our principal remedies in inflammation, to effect its purpose, should be as copious as the case admits of; following up the general bleeding by local blood-letting; or, when the former is interdicted by the constitution and condition of the patient, by cupping at the back of the head, or leeches behind the ears and at the temples; and after this, the continued application of cold to the head, with the occasional use of the vapour-bath—a remedy of considerable value, and active excitation of the bowels and liver; following these up by local irritatives—as the constantly renewed application of a blister, or the use of the ointment of emetic tartar. These are the means, aided by the necessary moral appliances to soothe and divert the patient's mind from those abstracting thoughts which have overwhelmed him, which should be simultaneously and early resorted to. Following them up, when inflammation of the organ may be supposed to be arrested, by constant exercise in the open air, the amusements of the field, or pedestrian travel, and a substantial, but not exciting, diet—and lastly, though not least in importance, a visit to some respectable hydropathic establishment. In chronic cases, or the state of more confirmed lunacy, gentle but prolonged salivation may be tried, succeeded by a succession of small caustic blisters to the scalp, with a seton in the neck, the occasional use of the vapour-bath, daily relief of the bowels, conjoined with diuretics and a moderate diet: that would appear to me to be the appropriate remedies.”

189. HEREDITARY TENDENCY TO INSANITY.—Insanity is said to be hereditary. It is so, as far as the disposition or constitutional tendency to the disease exists, but no further: and this disposition consists, I believe, in a preternatural weakness or susceptibility to determination of blood and arterial excitement, or inflammatory susceptibility in the lobes of the brain, wholly or in part; and, accordingly, were attention strictly observed to the avoidance of too early or intense application of the mind in the education of a child inheriting such a disposition, as well as to the occupation of such a person in after life being directed to agricultural or other out-door or mechanical pursuit, and abstaining altogether from spirituous beverages, and every cause of excitement avoided—to which might with advantage be added the use of the shower-bath, and attention at all times to the bowels—we should seldom hear the melancholy recital of several members of the same family being so afflicted.

190. CASE OF INSANITY SIMPLY AND SUCCESSFULLY TREATED. —I will now mention the case of a medical friend, in which the following simple means, illustrative of these views, were very successfully employed. He is an intellectual man, which in other words is to say, that his mind, if not constantly upon the stretch, is always actively engaged. Devotedly employed in getting up a course of lectures on a subject in which he felt great interest, he exhibited to those around him a good deal of irritability and delusion, in which state he went to Scotland, but returned thence, after lecturing some time, in a much worse condition; exhibiting, indeed, a state of positive insanity, so much so, that he would, in a Christian spirit, pick up in the streets, and bring home to his wife, half a dozen prostitutes for her to reclaim; and, on one occasion, he sold the coat off his back, having no cash about his person, to provide in charity for another poor destitute whom he found in the street. After this he went upon business into Hertfordshire, where, at two o'clock in the morning, he went to a cottager's house, which he contrived to enter unknown to the inmates, went up-stairs, and was discovered, by the squalling of the children, in their bed-room, endeavouring to pacify them, who were frightened by his entry. A friend was now obliged to go and fetch him home, and, on his return, it was advised that he should be placed in confinement: upon which subject his wife having called upon me, I expressed an opinion that his case was still amenable to medical means, and, with her co-operation, I would first try what could be done. On his return from Scotland, I had seen him, and advised him to lose some blood, and to take a few doses of calomel and cathartic extract, and his wife urged upon him to do the same, but without effect: he would not admit that there was anything the matter with him. I now provided her with a box of pills, composed of calomel, aloes, and gamboge, and also with a few papers containing three grains of emetic tartar each. One of the latter I directed her to dissolve every morning in his coffee, which being done unknown to him, he was thus rendered very sick. She now urged upon him, seeing how bilious he must be—and sick he really was—to take two of the pills I had prescribed for him, which, when the sickness was at an end, he was prevailed upon to do, and was thus kept at home; and in this way he was physicked for three or four days successively, with some benefit. I now saw him, and knowing his reluctance to lose blood, and his great fancy for baths, I prevailed upon him to go into Argyle Street and take

one of Whitlaw's vapour-baths: this he did, from which he perspired very profusely, and with so good an effect, that he slept soundly the same night, which he had not done for some weeks before, and with such conscious benefit, that he continued the bath by his own free will, till, in short, he became quite weak from its too frequent use, but with no return of his complaint. The violent perspiration which attended the use of the first bath, his bowels and biliary organs being free, completely absolved him from the delusion and excitement he had previously manifested, and he became now quite sensible of the folly he had been guilty of; and as, four years before, he had been under confinement for more than a year, in consequence of an attack of the same kind, and then had only got well after rambling over the continent of America and by diversified pursuits, he expressed himself highly gratified at the relief he had now obtained.

191. REMARKS ON BLOOD-LETTING.—In saying what I have with respect to blood-letting in cases of insanity, let it be understood that I do not recommend the indiscriminate use of the lancet—far from it, my object has been rather to exhibit what appear to me the true indications of treatment; and in so doing, I could not say less than I have said with respect to this remedy,—the insane manifestations of the mind presenting themselves to my perception, as based upon a condition of the brain which is in its character essentially inflammatory, as the post-mortem examinations of the insane indubitably prove—thickening of the membranes, serous exudation, and *ramollissement* of the brain, being, with few exceptions, invariably discovered. But I nevertheless know, that this inflammatory irritation may be so circumscribed in character, and centrically located, or limited in degree, that the fulness and action of the vessels of the part affected could not be influenced to any very sensible degree, or to an extent capable of fulfilling its resolution, by any quantity of blood we should be justified in taking from the patient. And it is further true, that inflammation may exist, and be located in this or other organ of the body, in a person whose constitution has been in other respects debilitated by the want of sufficient nourishment and other reducing agencies, and whose condition accordingly does not admit of general bleeding, but who nevertheless, were the inflamed part so situated as to be amenable to local depletion, would be benefited by its adoption. The indication is, therefore, as I have stated it to be; but the condition of

the patient may forbid it. It is further true, that uterine or other organic irritation may exist, and reflectively induce the mental affection; but this I do not believe would be the case, unless the predisposition existed, developed by mental disquietude or not, or inflammatory susceptibility of the brain were coincident: and to which I must add—the blood in some cases being disordered by the presence of some irritant, consequent on the torpor or defective function of one or more of the secretive organs, or otherwise acquired by the too free use of spirituous beverages, or of opium, tobacco, or what not. And with respect to the treatment of palsy—the remarks I have just made with respect to blood-letting in insanity, are equally applicable to its employment in this disease also.

192. MORAL TREATMENT OF INSANITY: EXERCISE, &c.—I have hitherto said nothing on the subject of the moral means of treating insanity,—a description of agency I hold nevertheless to be of first-rate importance; inasmuch as the diverting the patient's mind, and drawing his attention to other subjects and thoughts, to a new train of ideas, is, in fact, withdrawing excitement from the part affected, and locating it for the time in a different portion of the brain, to the relief necessarily of the part affected. And as we know the continued emotion of one train of thoughts will eventually produce preternatural excitement of the blood-vessels of that part, and occasion the disease, so the introducing a new train of ideas, and thus transferring emotion and excitement from the diseased part, may operate in like manner, and eventually arrest or palliate the disease. This I believe to be the principle—that of derivation, upon which moral means are found useful, in like manner as physical derivatives are found to be efficacious in a similar class of affections: thus a blister is applied on the chest when the lungs are inflamed, with the intention of inducing inflammation, and transferring it to a part of secondary importance, in relief of the one affected. Occupation for the insane is a measure of like character, with additional advantages annexed—when accompanied with prolonged muscular exercise, (especially so if attended by perspiration)—as in digging and in the employments of husbandry, or a carpenter's shop, long walks, or pedestrian travel; all of which expend power, and engage it on the muscular system, to the relief of the brain.

193. From what has been said, it must be obvious of how much importance it is that every cause and occasion of mental

irritation, or excitement of the patient, should be avoided. He should in no instance be contradicted or thwarted in any way, but be led by gentle and persuasive means to both think and act rightly. Experience must have proved to any person of ordinary observation, that an angry person is never to be pacified by opposition, but generally to be soothed or quieted by forbearance, till the cloud which obscured his reason has passed, when his mind returns to sanity, and he may be reasoned with. It is precisely the same with the lunatic: while the fit is upon him, which in general is more or less periodical, and dependent upon the state of the atmosphere, the condition of his bowels, or other circumstance—it is in vain to reason with him about his absurdities, or oppose him when excited: on the contrary, he should be calmed by soothing and indulgent treatment, at the same time active purging, copious sweating by the use of the vapour- or lamp-bath, leeches to the temples, or a large dose of opium,—one or other, or a combination of these means, according to the circumstances of the case and the condition of the individual, may afford great relief. The necessity for them should, however, rather be anticipated than have to be now provided for. And finally, when the paroxysm is at an end, and the patient calm, all the appliances for improving the general health and renovating the system, as will be pointed out in a future chapter, should be diligently carried into practice; and these are not incompatible with the continued use of a seton, which in many cases may be conjointly employed with much benefit, until the health is established.

194. Of the treatment of *tic douloureux*, *sciatica*, and other forms of neuralgia, I shall speak hereafter, when treating of the more frequent causes of these affections. Having completed an analysis of the diseases of the brain, and the more frequent forms of nervous affection, including those of the heart of most frequent occurrence, I shall now proceed, in continuation of the subject of dyspepsia, to treat of the further disorder and disease of the stomach and bowels, and organs associated with them, in assimilation, and secretion.

CHAPTER X.

OF THE DISORDERS AND DISEASES OF THE STOMACH, BOWELS, LIVER, AND KIDNEYS ; AND THEIR CONSEQUENCES—GOUT, SCIATICA, PILES, AND SOME AFFECTIONS OF THE SKIN, BLADDER, WOMB, &c.

195. THE STOMACH ; ITS DISORDERS.—The most frequent cause of disorder of the stomach is, the quantity of food being in excess, or its quality being objectionable in kind—and thus exceeding its functional or digestive power. The capabilities of the stomach must necessarily be proportionate at all times to the amount of its nervous supply or electrical excitement, and to the general tone of the muscular system, in which the stomach, as a partially muscular organ, will participate. The especial symptoms to which this species of disorder will give rise will necessarily be those of indigestion, or, in other words, digestion more or less imperfectly performed : hence, from the undue retention of the food in the stomach, and changes of a fermentative character, which under these circumstances will take place in its substance, arise the gases which become evolved, and the distension and flatulence, and sometimes pain, as well as acid eructation and nausea or sickness that ensue. And the stomach's disorder reacting upon the brain, through the medium of its nervous connexions, and imperfectly assimilated blood, will occasion headache, languor, and oppression, with a cloudy conception of mind, and benighted perception.

196. EFFECTS OF INDIGESTION.—The above are the especial symptoms, or direct effects of indigestion. The undigested acid material, passing from the stomach into the bowels, will probably now affect them in turn ; occasioning in some cases spasmodic or colicky pains, and in others flatulent distension of the bowels, or purging ; and ultimately, if this deteriorated process of digestion be the constant condition, from the absorption of these imperfectly assimilated materials into the blood, and the disorder of the secretive organs which will necessarily ensue, a host of ailments, in the shape of gout, rheumatism, cutaneous diseases of various kinds, as well as *tic douloureux* or other spasmodic and nervous affection. The treatment of all these affections, I may here, *en passant*, observe, must necessarily be based upon one general principle, namely, the restoration of the general

health; seeking this, however, through the purification of the blood, and the correction of the special derangement, whether it be of the stomach, liver, kidneys, or other organ which has given occasion to its impurity and disorder.

197. CONGESTION OF THE STOMACH.—Another cause of derangement to which the stomach is liable, is a congestive, or plethoric condition of the veins of the stomach, occasioned in most cases by obstruction in the liver. The blood, it will be remembered, having to pass from the stomach and bowels through the liver on its return to the heart, obstruction and impediment to its passage through the liver will necessarily throw the blood back upon these organs, and congest them accordingly. The congestion, or cause of the stomach's derangement in this case, having its seat in the liver, we shall defer what we have to say on this subject till it comes more prominently before us in considering the diseases of that organ.

198. From the above statement it may be readily apprehended, that with the exception of any disease of a specific character, such as cancer, the disorders and diseases of the stomach and bowels are with a few exceptions secondary to, or associated with, those of the liver. And this being the case, to comprehend the diseases of the former, some previous knowledge of the latter is indispensable; and accordingly, I shall here introduce just so much of the subject as is necessary to the understanding of that which is now more immediately the object of our attention.

199. TORPOR OF THE LIVER, AND ITS EFFECTS.—Torpor of function is the first and most frequent form of derangement of the liver, dependent in most cases upon *enervation* primarily or secondarily induced. Primarily, from deficiency of electro-nervous excitement, as a consequence of general debility, or secondarily upon excess of nervous expenditure in mental employ, perturbation or the like; or it will occur from congestion of the organ however occasioned—distension of the blood-vessels of the liver necessarily producing oppression and torpor, and their consequence—the organ's defective secretive function. And as defect of function, and relief of the organ of the amount of fluid which should have been thus excreted as bile must tend still further to augment the congestion, or occasion it where it did not previously exist, there will as necessarily ensue a remora, or plethoric fulness of the veins of the stomach, bowels, and spleen, to a greater or less extent—as these vessels all unite in bringing their blood to the liver. Added to which the blood, returning

the liver, loaded with the alimentary fluid in the stomach and bowels, and which, in consequence of torpor, is but imperfectly assimilated and purified, derangements in the function of other organs will result from this cause. Torpor of the liver will necessarily be attended with torpid bowels, from the want, not only of their natural stimulus—bile, which should be poured out into them from the liver and is the ordinary cause of their excitement,—but from another cause also, namely, that of these organs, all receiving their nervous supply from the same source; and if this be deficient, as it is in respect of the liver, so must it necessarily be as regards all the rest; and torpor, with constipation and congestion of the bowels will take place, abounding in consequences to be pointed out hereafter.

200. THE CAUSE OF THE EXTREME FREQUENCY OF LIVER COMPLAINTS.—Congestion of the liver will occur to a greater or less degree from every cause interrupting the balance of the circulation. That is to say, whenever the motive power is not equal to the resisting power, or, in other words, when the quantity of blood to be circulated is in excess of the power of the heart—plethora, with congestion of the liver more particularly, will ensue. The blood being circulated to every other part of the system, directly to and from the heart, by the power or active momentum of that organ aided by the action of the capillaries in the extreme vessels. But with respect to the liver, it has to be first circulated through the vessels of the stomach, bowels, and spleen, and thence as venous blood—deprived of its exciting qualities, it has again to be circulated through the liver. The circulation therefore in the liver, wanting the aid of the heart's force, and defective also in capillary excitement (without the blood receives a fresh supply of oxygen—which I now believe it really does by the absorption of air in the stomach and bowels), must of necessity be more feeble than in any other organ; and here accordingly, on every cause of the heart's reduction in power, will congestive accumulation more particularly take place*. In short, did not a safety-valve of this

* Seeing how important the action of the capillary vessels is to the circulation of the blood in general, and especially so when we consider how remote the heart's power in the extremities is to the column of blood to be moved by its agency, it has always been a matter of astonishment to me how the circulation in the liver could be effected at all; seeing that the blood for circulation through the liver, furnished by the portal vein, is venous, and therefore deprived of its especial vital properties, or, in other words, devoid of oxygenous

kind exist, oppression of the more important organs of life, or rupture of the blood-vessels, or exudation from them, would be a constant occurrence, from any cause depreciating the heart's power. The spleen, however, from its connexion with the liver, and its distensible character, must of necessity become engorged also; but as it has no secretive or other important function to fulfil, this is of very secondary consequence. Hence the frequency of liver torpor and derangement; for it is obvious that no disorder of the system can take place without being productive of debility, more or less, of the general system, involving necessarily the heart's power, and thus deranging the balance of the circulation, and inducing congestion of the liver and its consequences—disorder of its function and deranged secretion; and hence the universality and utility of the celebrated Abernethian remedy—blue pill and its consort calomel.

particles—the essential qualifications to chemical action and capillary excitement. But of late, light has broken in upon my understanding, and I am of opinion, I can now see clearly what had appeared to me so mysterious, and which I shall now explain. Magendie, who analysed the gases contained in the stomach and bowels of three criminals immediately after execution, found in the stomach of the first, who had taken a meal an hour before, eleven per cent. of oxygen, with seventy-two of nitrogen, and fourteen of carbonic acid. The intestines contained no oxygen, and but twenty per cent. of nitrogen. In the second, who had taken a meal two hours before, the intestines contained no oxygen, and but fourteen per cent. of nitrogen; the remaining gases being carbonic acid and hydrogen. In the third also no oxygen was discovered, but about fifty per cent. of nitrogen in the bowels. Now when the fact, that oxygen was found in the stomach but not in the bowels is taken into consideration, with others—that in the process of mastication much air must be combined and swallowed with our food, and with the saliva we are constantly swallowing, and is also received into the stomach in combination with water, which in common with the rest of the animal creation is man's proper beverage; here it will be obvious is an abundant source of power. The surface of the stomach and bowels, like the cutaneous, I should therefore say, has a respiratory function, and with the absorption of the food by the veins and lacteals on their surface, oxygen is also imbibed; and chemical action is thus induced in the contents of these vessels, and excitement imparted thereby, not only to the capillary vessels of the liver, but to the lacteal absorbents also. And these views are confirmed, I am of opinion, by the fact, that ruminating animals, which are all vegetable feeders, and require therefore a larger amount of food and an increased supply of oxygen for the maintenance of a more active condition of the liver and lacteal absorption—in chewing the cud, thus obtain the oxygen required; animalizing the product at the same time, by the nitrogen simultaneously acquired. On this subject, see a Paper of mine which was read at the meeting of the British Association, and published in their Reports of 1846.

201. TREATMENT OF INDIGESTION.—The general principles to be pursued in the treatment of the disorder of the stomach first mentioned, having been in a former chapter under the article *Dyspepsia*, already detailed, I have here only to add, that when heartburn or acid eructation is experienced, in addition to a pill of calomel and aloes being taken every night, or second night, the following mixture may very advantageously be conjoined: one drachm of carbonate of soda, with three drachms of sulphate of soda, dissolved in half a pint of the infusion of gentian or cascarilla bark, a fourth part to be taken two or three times a day. In some cases, as gentle tonics, the mineral acids are found more successful, in the proportion of twenty drops of the diluted nitric, or sulphuric acid, in half a tumblerful of cold water three times a day; avoiding at the same time fruit, pastry, vegetables, tea and other sugared slops, or whatever else the individual's observation may have pointed out to him was objectionable; and though last not least, being particular at all times to well masticate his food. The improvement of the general health should also be provided for—by attention to air and exercise, and the use of the cold bath; and for reasons which will appear obvious on reading the note appended to the last paragraph, cold water would probably be found the best beverage.

202. Another cause of the stomach's derangement I have shown to consist in a congestive condition of the blood-vessels of that organ and of the liver, the symptoms being those of indigestion, or principally so. The appetite is, however, in such cases, often craving or capricious rather than deficient, and after meals there is not unfrequently a sense of heat and pain in the stomach, or a degree of sickness is experienced, and pain in the stomach upon external pressure. The cause of the stomach affection being obstruction in the liver, the pills of calomel and aloes are clearly indicated; and in addition to one of them being taken every night, the bowels should be kept lax by the mixture of the salts and soda previously recommended.

203. Should relief not be obtained after a week's trial of these means, bleeding should be had recourse to by the application of a dozen leeches to the pit of the stomach; or to where is better, around the anus or fundament—should there exist any tendency to piles; or should the breathing be oppressed, it should be adopted in the first instance, and ten ounces of blood be taken from the arm, and again a week after if necessary, and these means should be continued till health is regained.

204. PILES, FISTULA, AND DISEASES OF THE BLADDER AND WOMB.—A common consequence of congestion of the bowels and torpid liver, when of some duration—is piles; which are nothing but small tumours formed by distended blood-vessels around the external opening of the bowels—the blood gravitating to these the most dependent parts, and forming these tumours: they generally burst and discharge blood, and occasionally very copiously, Nature, with her usual providence, in this way attempting her own relief. When they do not burst, they constitute what are called blind piles, and from their situation and connexion frequently become inflamed, and thus is abscess formed, and fistula occasioned in consequence. The congestion of the veins of the bowels in other cases implicates those about the neck of the bladder in the male, and occasions spasmodic stricture on the one hand, and enlargement and disease of the prostate gland or an irritable bladder on the other: to which affections man at a certain period of life becomes so liable. Or in the female, congestion of the neck of the womb and leucorrhœal discharge take place, or enlargement or other affection of some kind of the womb, or its appendages, as dropsy of the ovaries, is developed.

205. With respect to piles, I have only to add, that leeching the fundament, and otherwise treating them as affections dependent on and connected with congestion of the bowels and torpor of the liver's function, is the best and only proper method of treating them. To the diseases of those organs I must accordingly refer the reader, more especially as the treatment indicated applies directly to the removal of the cause of this complaint, as well as to the numerous other affections adverted to, namely, spasmodic stricture either of the bowels or urethra, enlargement of the prostate gland, or irritable bladder in the male; as well as to leucorrhœa, or other affection of the womb or its appendages, in the female. Neglect or ignorance in respect to which affections in their early manifestations, giving occasion to so much suffering and loss of life at after periods: whereas all these affections will readily give way to the judicious employment of the means adverted to, if early employed, and aided by such local appliances that each case may respectively require.

206. RELAXATION OF THE BOWELS, AND ITS TREATMENT.—A frequent ailment of the bowels is diarrhœa, or looseness. This may happen, as I have before observed, as an effect of disorder of the stomach,—of irritation imparted to the bowels by acidulous and imperfectly digested food: unripe fruit, nuts, veal or pork in

some persons, or any other indigestible or unwholesome substance, will occasion the same result: Nature in this way seeking her own relief. Vomiting, also, is often excited by the same causes operating in a more aggravated degree, and with the same provident intention. In short, Nature in most derangements of the system attempts her own relief; and half the symptoms connected with disease are but the manifestations of her efforts in progress towards this end; and which accordingly it is the duty of the physician—Nature's help-mate—to aid and support, occasionally to moderate, but seldom to act in opposition to, or suppress. In accordance, therefore, with the indications of Nature, the treatment of these cases of relaxed bowels from indigestion and irritation, are gentle aperients—such as rhubarb, magnesia, or castor-oil; followed up after sufficient evacuation, by a few drops of laudanum, say from twelve to twenty drops,—supporting the system at the same time with a little spiced broth, beef-tea, or other light fluid nutriment of the same kind. An emetic, likewise, (consisting of a grain of emetic tartar dissolved in a tablespoonful of hot water, repeating it ten minutes after if necessary—or twenty grains of ipecacuanha powder,) is another remedy often of much benefit. Nature points out this for our adoption—the cause in operation, when in an aggravated degree, being in general attended with vomiting—with the view, not only of removing the offensive substance from the stomach, but with the intent also, by the excitement of vomiting, of emulging the liver, and increasing its secretive function, and thus removing congestion from the bowels and preventing inflammation—which as a sequel of relaxed bowels is too apt to occur. And in furtherance of the same intention, of increasing the circulation through the liver, calomel is also a most useful remedy. Should the disorder continue in despite of an emetic, calomel in conjunction with a little opium to allay irritation and secure a little rest to the patient, will fulfil every indication. With these views, a grain of calomel with a third of a grain of opium, made into a pill, should be taken every two or three hours, for three or more doses—according to the necessity of the case; husbanding at the same time the powers of the system by the recumbent posture and a warm bed.

207. A SEVERER FORM OF DIARRHŒA AND CHOLERA.—There is another cause of relaxed bowels, very common in damp weather, developed by the agency of cold upon the system. Cold thus checking the secretion of the skin, and the exhalation of the

perspirable secretion, occasions engorgement of the liver and torpor of its function; and in consequence of the retarded passage of the blood through the liver, and distension of its vessels and those of the bowels, which co-exist, from suppression of the perspirable secretion—a serous or watery exudation from the veins of the bowels succeeds; and thus the watery purging: and if this implicates the vessels of the stomach, nausea, or vomiting also follows. This affection is more common in autumn, when vicissitudes of temperature are great, and the bowels, from the previous effects of heat upon the cuticular and liver function, are predisposed to congestion and derangement. And occasionally, when cold thus operates, in conjunction with malaria, which in some seasons and situations abounds—their conjoint effects develop a highly aggravated affection of the same kind, called cholera. The characteristic symptoms of which are the following—watery purging, more or less colourless according to the severity of the case: as the colour imparted to the evacuations in health is due to the biliary secretion, its presence here necessarily indicates a less amount of disorder of the liver, and consequently less disease. Vomiting, from implication of the stomach, is likewise a frequent concomitant symptom; and there is in general great debility, with giddiness and prostration of all the functions or active powers of the system; and a proportionate reduction also of the temperature of the body, or coldness is experienced. Cramps or spasms of the bowels or extremities are also frequent symptoms; and if the disease is severe, or of the epidemic kind, suppression of the urinary secretion is another characteristic symptom.

208. TREATMENT OF DIARRHŒA.—And now what are the indications of treatment? In the minor ailment of diarrhœa or simple form of affection from cold, these consist principally in restoring the functions of the skin; for which purpose the patient should betake himself to a warm bed, and take thirty drops of antimonial or ipecacuanha wine, with eight drops of laudanum, in two tablespoonfuls of water, every two or three hours; with a cupful of warm barley-water, thin gruel, or wine-whey between the doses, till perspiration is induced; when a grain or two of calomel should be taken to secure the integrity of the liver's function; and this being effected, which will be indicated by bilious evacuation of a yellow appearance, nothing further will be required. Or instead of the antimonial wine, the following pills may be substituted, which with a warm bed will fulfil all the indications:

calomel eight grains, opium and emetic tartar, of each a grain and a half made with conserve of roses into twelve pills,—one to be taken every two hours till perspiration is induced and the stools are bilious. Should vomiting be induced by either the pills or the drops, the intervals between the doses may be prolonged to every third or fourth hour.

209. CHRONIC DIARRHŒA.—A chronic relaxed state of the bowels is another condition connected with biliary derangement; the patient having two, three, or more relaxed evacuations in the twenty-four hours, not unfrequently occurring at an early hour of the morning. This is a curative effort of the system in relief of abdominal plethora. The treatment accordingly should be in furtherance of these intentions: a dozen leeches should be applied to the anus, once, twice, or oftener, and if there be pain on pressing the abdomen, or straining at evacuation, till these symptoms are removed; or bleeding from the arm will answer the same purpose. At the same time a pill of one grain and a half of calomel in combination with half a grain of opium and as much ipecacuanha powder, should be taken every night; and in the morning also if pain in the abdomen be a constant symptom; with an occasional dose of castor oil, and a diet of light puddings, rice, and food of the like farinaceous description. In these cases it will often be well to continue the pills till the gums become tender; or if the disease has been of lengthened continuance, till gentle salivation is induced; as a low form of inflammation accompanied with ulceration of the bowels is no uncommon consequence of neglect—and which may be thus averted.

210. TREATMENT OF CHOLERA.—And now what are the indications of treatment in that severer form of affection of the bowels induced by cold and malaria? They are obviously the restoration of the functions of the liver and skin, or principally so:—the depressing influence of malaria on the system, one of the elements of the disease,—seeing that fever is not developed, being best averted by the remedies to be employed in fulfilling these indications: the effect here surpassing in importance their cause. With this intention, there is no remedy to be compared to calomel—the most potent of all stimulants, as I have elsewhere attempted to prove. A comfortable warm bed and an emetic should precede all other remedies,—the emetic for the purpose not only of assisting nature in her efforts to remove congestive obstruction, and increase the secretive function of the liver, but for the purpose also of clearing the stomach and

bringing our remedies in immediate contact with its surface in furtherance of their absorption,—which, from the congestion of the blood-vessels, which in these cases is considerable, is proportionately diminished; and in relief of which bleeding, where there is pain in the stomach or liver, or vomiting or oppression of breathing, should not only be practised, but be the earliest remedy resorted to—taking the blood in small quantity at a time, and at short intervals till these symptoms are relieved. Soon after the operation of the emetic, the calomel should be given, and as the absorbing power of the stomach is reduced, and the susceptibility of the system to its influence is diminished also, it must be in doses proportionately large, and commensurate to the emergency of the case; and with the view of allaying irritation and husbanding the powers of the system, the first dose may be combined with a little opium. In these cases, therefore, six grains of calomel with a grain of opium, given in powder that it may be diffused over a great extent of the stomach's surface, should be immediately given, and half or one-third of the same dose of calomel (without opium) may be repeated every two hours afterwards, till the patient is relieved, and then continued at longer intervals, till bilious evacuations succeed; and when this takes place, at still longer intervals, till healthy yellow bile appears in the evacuations—when a dose of castor oil, or other mild aperient to prevent any further effect from the calomel, will be all that is necessary. Conjoining with these remedies, however, in the early treatment, if there be much exhaustion, light cordials—as spiced negus, or warm brandy-and-water, but in very small quantity—a table-spoonful or two at a time—to prevent puking and oppression, till relief is obtained. When desire for cold water is experienced, this, or barley-water in small quantities, at the pleasure of the patient, may be substituted—attending at all times to nature's promptings, but observing moderation in all cases. A large mustard plaster over the region of the stomach and liver is often a useful auxiliary. For this purpose some fresh-made mustard as for table use, but a little more fluid, should be spread upon a napkin, and when applied to the part, kept on for as long a period as can be conveniently borne by the patient. Should vomiting be a troublesome symptom, this is best remedied by keeping the bowels excited by the frequent administration of a clyster.

211. EPIDEMIC CHOLERA.—The severer forms and epidemic visitations of cholera almost invariably come on by, or succeed

to, an insidious attack of diarrhœa; the case in general being considered that of diarrhœa so long as the evacuations are more or less coloured, and of cholera when they are devoid of this, or of barley-water-like appearance—evinced that the biliary secretion, which imparts to them its colour, is arrested; and when so, the urinary secretion is in general suppressed likewise. The blood, thus poisoned by the presence of the effete elements of these secretions, now ceases to maintain the excitement of the system, and all the powers are prostrated; the pulse accordingly is scarcely to be felt, the skin and breath are cold; and from the highly congested state of the stomach and bowels (as evinced by the watery evacuations—which are simply serum exuded from these vessels) absorption is at a dead stand-still, or nearly so: hence, in my opinion, the great fatality of the disease—our remedies not gaining admission into the blood, where alone they could produce any useful effect*. In these cases it is obvious therefore, that the calomel to be useful (referring to the treatment we have recommended in the former paragraph) must be given in doses commensurate with the greater requirements of the case, without stint, in large and repeated doses—that is to say, in doses of twenty grains every hour, half hour, or in desperate cases, every ten minutes; and that it may be diffused over the greater extent of absorbing surface, placing it on the tongue with a grain or two of table salt, and with a spoonful of water, directing the patient to gargle it about his mouth before swallowing it. And as it is not the quantity but the effect produced which should govern us in the administration of any remedy, let this be continued (observing at the same time what has been said on the subject of blood-letting, &c. in the last paragraph) till the skin improves in temperature and the pulse in volume—which are the earliest symptoms of amendment, and as this

* I have long since suggested, and would again do so (addressing myself now to the profession)—the trial of a solution of the bichloride of mercury; seeing that the calomel must first be dissolved before it can be absorbed into the blood; and seeing also that it could be dissolved by the agency alone of the hydrochloric acid of the stomach's secretion, which, in common with the rest of the secretions, in these cases, must be arrested. I would suggest therefore—that two grains of the bichloride of mercury be dissolved by the agency of two scruples of the hydrochlorate of ammonia in two ounces of water, and that a tea-spoonful of the solution—the eighth part of a grain—be given in two table-spoonfuls of water, in conjunction with the calomel, every half hour till excitement is developed, and after this persevering with the calomel alone.

takes place, gradually reducing the quantity of the calomel, but not too hastily, till both bile and urine are abundantly secreted; and when this occurs, a little further steady perseverance in the same means will soon place the patient out of danger.

212. FEVER SUCCEEDING TO DIARRHŒA.—In a severe affection of the kind arising from malarious influence, after the secretions from the bowels have become healthy, it will be proper to follow up the treatment with a decoction of bark to the extent of half a pint a day—a quarter part being taken at each dose,—or an equivalent quantity of the sulphate of quinine, that is, in doses of a grain, either in powder or made into a pill, four times a day. This is recommended with the view not only of giving tone to the system, but also of preventing the development of fever, which malaria very frequently gives rise to after the bowel affection has been controlled; and which in the early stage of these cases, being of a low remittent character, and coming on once or oftener in the twenty-four hours, is so obscure, that it is only to be detected by the professional attendant being widely awake to the probability of such an occurrence; and which if undetected, and allowed to progress—which is frequently the case—developes low inflammation and ulceration of the mucous membrane of the bowels, in the parts first affected with congestion, and is now attended with typhoidal fever. For further information on this head, see what is said in a subsequent chapter on the subject of malarious fever.

213. CHOLERA MORBUS, OR BILIOUS VOMITING AND PURGING, will be treated of as an affection of the liver.

214. CONSTIPATION, AND INFLAMMATION OF THE BOWELS, AND THEIR TREATMENT.—An opposite class of symptoms sometimes arise from the effect of cold upon the bowels, giving rise to constipation and inflammation; dependent no doubt upon the particular circumstance of exposure, predisposition, and constitutional susceptibility of the individual; whereby, instead of exudation following, to the relief of the congested and obstructed vessels, inflammation of the bowels is developed; implicating, in most cases, the peritoneal or outer coat of the bowels also:—hence the pain in these cases, constipation, and tension of the bowels, or spasm; and, from the connected implication of the stomach, the vomiting also that so generally ensues. The vomiting is no doubt intended for the protection of the bowels from further irritation, which would attend the introduction of food or aught else into them, as well as for the excitement of the liver and the

circulation of the blood through that organ, in relief of the bowels; everything in most cases being rejected, with the exception perhaps of a little cold water, for which there is often great desire expressed. The treatment indicated is evidently the removal of the root of the offending cause—the distension of the blood-vessels of the part, and inflammation—or increased action of the vessels, which it has given rise to. The distension of the veins in this case preventing the free admission into them of the blood from the capillary arteries, these become distended and excited to increased action—or inflammation, to remove the obstruction. The removal of the congestive fulness of these vessels, experience proves is best effected by a copious bleeding from the arm; following this up by the application of twenty leeches over the seat of pain; and, on their removal, immersion in a warm bath, at a temperature of ninety-eight, or that most agreeable to the feelings of the patient, for twenty minutes or longer, following this up by the continued application of a hot bran poultice over the whole seat of the affection; or, what is equally useful—a soft towel wrung out in hot water, and over this, to prevent cold by evaporation, several folds of flannel; occasionally renewing it, and never allowing it to become at any time unpleasantly hot or otherwise cold to the feelings of the patient. With the view also of increasing the circulation through the liver and the secretion of bile, and thus relieving the congested vessels of the bowels, calomel is the proper remedy in the dose of two grains administered every three or four hours, till bilious stools are obtained, when a table-spoonful of castor oil or a weak solution of Epsom salts may be occasionally conjoined. The patient during the period should take nothing but a little barley-water, gruel, or the like, and these in quantity not exceeding two or three spoonfuls at a time; which, however, may be frequently repeated, according to the dictates of nature and the desire of the patient. In addition to the foregoing means, a clyster of thin gruel with a tea-spoonful of salt in it and a table-spoonful of oil, may be often advantageously employed, especially if the stomach is very irritable; repeating the same every two hours, or oftener. But no purgative or other irritant should be administered, either in this way or by the stomach, till bile is secreted; the obstinate constipation not being the cause in these cases, but the effect of inflammation. And here let me observe, that even in cases of inflammation of the bowels which may be supposed to arise from this, perhaps its most frequent cause, I

believe the following rule will hold good,—that it is in vain to attempt the relief of the constipation till inflammation has been subdued; and the best means of accomplishing this end, are those I have already pointed out; and which, indeed, go directly to the relief of the constipation by increasing the biliary secretion—the deficiency of which, from torpor of the liver, being, I believe, the cause of constipation in general: and for what I have further to say on this subject, I must refer the reader therefore to that of Liver disorder.

215. IMPORTANCE OF ACTIVE MEASURES IN THE TREATMENT OF ACUTE INFLAMMATION.—In severe cases of inflammation, in addition to the means enumerated, should the symptoms justify the measure, that is to say, should the pain of the bowels and vomiting continue, the pulse at the same time being sharp and wiry—the bleeding from the arm should be repeated, and the blood be taken from a large orifice, to the effect of inducing fainting; and for this purpose, when the bowels have been long constipated, the patient should be taken from bed and, supported by an attendant, be made to walk, and being now bled whilst walking, fainting is soon induced, and with it I have often seen the bowels spontaneously relax and pour forth their contents, when the disease has been at once arrested. Applying a dozen leeches to the anus, is also another excellent expedient in these cases, encouraging a flow of blood from the part, after the removal of the leeches, by the application of a warm poultice; but this will not supersede the necessity for the general bleeding in severe cases.

216. After a few doses of calomel have been taken, it sometimes happens that, from a flow of bile into the irritable bowels, considerable griping pain is induced: this must not be mistaken for increased inflammation; it is best relieved by a frequent clyster of warm gruel, or a small dose of castor-oil, in substitute for a dose or two of the calomel, but which must be still continued till the secretions become of healthy appearance; the bile in these cases being, from long previous retention in the gall-bladder, often exceedingly dark—the colour of pitch, acrid, and unhealthy.

217. Again, in a less severe form of affection, the application of the leeches alone in sufficient number, followed up by the warm bath, or the constant fomentation with hot water, or the application of a bran poultice to the abdomen, and the conjoint administration of calomel and clysters, is all that may be required.

But in so saying, let me be understood to signify, as the fruit of long experience, that it is infinitely better to do a little more than is absolutely indispensable in the early treatment of all cases of active inflammation of the organs of life, rather than one particle less than is necessary: the evil consequence in one case being only a little temporary debility, but in the other, too frequently the loss of life,—unsubdued inflammation of the bowels, if of an active character, terminating in mortification; and when of a subdued form, in ulceration. As there are no other remedial measures that can be pursued with reasonable hope of success, than those I have pointed out, excepting the application of a rag wetted with oil of turpentine, or a blister, over the region of the bowels, which in protracted cases may often be beneficially employed, these must be steadily pursued, in a ratio to, and commensurate with, the severity of the case and the emergency of the symptoms*.

218. TREATMENT OF INFLAMMATION OF THE SPLEEN, BLADDER, KIDNEYS, WOMB, &c.—The same treatment and the same observations are equally applicable to inflammation of the stomach, and of the liver, the spleen, the kidneys, the bladder, the womb, peritoneum, and, in short, to inflammation of all and any of the abdominal organs. The symptoms of course will be modified in character by the particular function and locality of the organ affected; but they will be alike in kind, attended with pain, suppression of function, and in general with vomiting; Nature, with her usual benignity, interposing her shield, and rejecting everything that might prove injurious or augment the mischief. The pulse, too, will be accelerated, and the skin hot; in short, fever will be concomitant, and in general commensurate with the extent and severity of the inflammation in its acute stage, and so long as bleeding is advisable in its treatment; but not so in the

* The talented and experienced surgeon, Mr. B. Travers, F.R.S., in his work on Inflammation, justly observes, "In visceral inflammation venesection is indicated and warranted to the utmost extent that the powers of life will bear; for here the mass of blood is so altered and spoiled for its proper and healthy purposes by the direct implication of the blood-making and preparing organs in the disease, that relieving the system of its presence, to the full extent that it can be borne, is the main resource we possess for its preservation. A freer circulation through the small vessels, and those of the excretory glands especially, ensues almost immediately upon a full bleeding; and the inflammation, if not really abridged by its effects, is disposed to a kindlier termination."

more advanced stage of its progress, the pulse then becoming soft and subdued, and the skin perspirable.

219. Extreme excitement is generally productive of suppression of function. This holds good, I believe, in all conditions of the system, mental and corporeal, as I have elsewhere pointed out. And thus the secretive function of the liver and kidneys is suppressed in inflammation of those organs, and that of the skin in the hot stage of fever. Accordingly, in all cases of acute inflammation in which the stomach admits of the remedy—that is to say, when there is no vomiting, but heat of skin and excited pulse—advantage will be derived from combining with the calomel a minute portion of tartar emetic and opium, a quarter or the sixth part of a grain of each, which by their soothing and depressive influence on the system will tend to moderate the heat and excitement of the circulation, and be productive thereby of perspiration; and thus, true to Nature's indications, aid in the relief of the local affection. And with the same view of reducing excitement, a table-spoonful of the liquor of acetate of ammonia, or a scruple of saltpetre in a wine-glassful of water, may be also advantageously given between the doses of the pills of calomel and opium.

220. Premising, however, that in all cases wherein the stomach or bowels are not the immediate seat of the disease, (where they are, a frequent clyster of warm gruel should be substituted,) a mild but active purgative should be administered, with the intention of relieving the bowels from any feculent accumulation, or other cause of irritation. With this view, an ounce of castor-oil, or an infusion of senna with salts, should immediately follow the bleeding; the calomel and opium of course being omitted, till the purgative has effectively operated.

221. In inflammation of the bladder, the irritability of the organ is so much increased, that there ensues a constant desire to void the urine, and its passage is often attended with a sense of scalding, and sharp pain on the expulsion of the last drop is felt at the extremity of the urethra; and in some cases it is attended also with spasmodic pain in the bladder, and which is communicated to the bowels also—occasioning a sense of bearing down and desire of evacuation. The treatment in this case, in addition to the pills of calomel, opium, and emetic tartar, previously recommended, and an occasional dose of castor-oil, consists of leeching freely, or better, cupping, the perineum, or part immediately below the organs of generation: this should be fol-

lowed by immersion in a warm bath for half an hour or longer, and after this the renewed application of a warm poultice to the leech-bites; the patient drinking abundantly also of barley-water, linseed-tea, or other demulcent fluid. After the acute symptoms have subsided by these means, and fomentation with hot water, by the use of the biddit night and morning, the balsam of copaiba will prove a very useful remedy—in doses of half a drachm, or two or three of the capsules three times a day, followed by the use of the cold sitz-bath for four or five minutes every night and morning.

222. GRAVEL AND CALCULI; THEIR CAUSE.—There are many other affections of the kidneys besides inflammation, a few of which, of more common occurrence, I shall now briefly notice. The office of the kidneys is to eliminate or divest the blood of certain impurities, chiefly of a saline nature—urea and lithic acid more particularly—the products of the combustion of the reflux matter of animal substance and worn-out particles of the system, or the combination of their nitrogenized elements with the oxygen of the blood; and which being thus held in watery solution, constitute urine. These and other salts contained in urine are soluble in a certain amount of water, and when secreted by the kidneys, and retained any length of time in the bladder, if the urine when secreted was saturated with the salts, and absorption of any portion of the water by the bladder should take place, which is commonly the case, (and hence the higher colour and greater specific gravity of the urine in the morning, from its retention during the night,) the salts become in excess, and being precipitated, occasion the deposits of gravel and calculi—or stone, which take place in the bladder. As the solubility of these substances is in general proportionate to the temperature of the fluid, we often notice their deposition in the chamber utensil after the urine becomes cold;—an occurrence which, *en passant*, I may notice, pretty clearly points out, that the individual would be benefited by a greater amount of watery beverage, and a less amount of animal sustenance.

223. GOUT, RHEUMATISM, SCIATICA, AND CUTANEOUS AFFECTIONS; THEIR CAUSES.—Returning now to these products, urea and the other saline substances formed in the blood: if the quantity exceed the secretive and depurative office of the kidneys, they will abound in the blood, and become, during their circulation through the system, a cause of irritation and excitement to the fibrous and nervous tissues more particularly; developing

gout, rheumatism, and a variety of other painful and spasmodic affections, of which this is therefore not an unfrequent cause. The cause, however, may consist, not in the excess of these materials, but in the default of the secretive function of the kidney; its function being reduced, or rendered torpid, by the agency of cold or other cause depreciating the supply of nervous power. The kidneys are therefore liable to torpor, and derangements of function, as well as to disease of structure. The secretion is also liable to be deranged in kind, by the condition of the blood abounding in certain other elements, which should have been eliminated either by the liver or the skin, or resulting from the imperfect assimilation of the food by the digestive organs; and thus again are gout, sciatica, or rheumatism, or diabetes and the like affections, induced; as well as many eruptive and other cutaneous diseases occasioned. And again, from these causes being singly or conjointly in operation, or modified and augmented by irritation, existing in, or being extended to the membranes of the spinal marrow or brain, not only will sciatica and tic douloureux, but a complexity and variety of painful and spasmodic affections be induced.

224. ALBUMENARIA, AND CONGESTION OF THE KIDNEYS.—Congestion is another affection to which the kidney is subject, and a frequent cause, no doubt, of albuminous urine, which is a serous exudation from the congested vessels rather than a secretion of the organ. Hence it so frequently marks a degeneration of the structure of the kidney, which Dr. Bright has taught us is so frequent a cause of death. The primary cause may be either cold; or the exhaustion succeeding to the habitual excitement of the organ by spirituous beverages may thus occasion its congestion. It often exists without pain, further than by a sense of lumbago or rheumatic pain in the loins—which accordingly should in all cases receive much more attention than is usually bestowed upon such affections; sciatica, too, is no unfrequent premonitory symptom of this affection. The treatment is obviously bleeding from the arm, followed up by occasional cupping on the loins, with the frequent use of the warm or vapour bath; and the excitement of the capillary vessels, and secretive organs generally, by calomel, in combination with sedatives, and an occasional purgative such as castor oil, rhubarb, or senna, avoiding all those of a saline description.

225. Congestion, however induced, may be succeeded by inflammation of the organ. The secretion of urine in this case

will be suppressed, and more pain be experienced; when, in addition to blood-letting, which should be of a more active description, and the vapour-bath, the continued application of a large poultice to the loins after cupping, and subsequently a blister, may be recommended. And the calomel, in combination with opium and emetic tartar, or digitalis, should be continued, with an occasional dose of castor oil, till gentle salivation, the most certain resolvent of inflammation, is induced.

226. GENERAL TREATMENT.—The treatment of all the cases of disordered secretion mentioned, as I have before noticed, must be based upon one general principle, namely, the restoration of the general health; seeking it, however, more particularly through the blood's purification, and attention to the especial derangement which has given occasion to the particular affection. And thus should gout be treated; the characteristic symptoms of which are, pain of an acute character, situated in some of the joints or other of the ligamentous structures, and more or less of an intermittent spasmodic character, and attacking the great-toe or ankle in persons of a plethoric habit more particularly, and developing in such cases inflammation and swelling of the whole foot. In other cases, the knee, the wrist, or the knuckles, will be the seat of the affection; and it will be, moreover, often transitory in its location, shifting from one joint to another, thus evincing that the blood is the seat of the disease, and that the local affection is but its consequence. In this erratic form, the pain often exists without any swelling of the part. In some cases, and generally so in those of the latter description, the disease will exist without fever; in others, especially if the immediate exciting cause of the attack has been cold, this will exist also.

227. THE TREATMENT OF GOUT.—The symptoms are those we have described: now, what is the treatment? Evidently the purification of the blood by the excitement of the secretive organs; removing, however, if it be possible, in the first instance, the immediate exciting cause of the attack, whatever that may have been; or its more immediate effect when this is not to be done, as with cold, which I before mentioned is frequently an exciting cause in those who are predisposed to the disease, as it checks the secretion of the skin, congests the vessels of the kidney, and deranges its function, in common with that of the liver.

228. Constitutional predisposition to any particular form of

disease, we know, may be hereditarily engendered, as well as otherwise acquired. It will occur to the mind, therefore, that this hereditary tendency may consist in some especial debility of the organization; and in gout, to consist in a torpid action, or liability to derangement of the function of the kidneys, or a weak state of the assimilative and depurative organs of some kind. I mention the kidney in particular, as the derangement of its function in gout is one of the most frequent and characteristic symptoms of the complaint. There are other diseases of a hereditary nature, which we may suppose to be connected with a parentally imparted taint of blood.

229. In addition to cold as an exciting cause of the attack in gout, may be mentioned one of perhaps still more frequent occurrence, namely, irritation of the bowels, or derangement of some kind of the digestive organs, induced by eating excess of animal food, fruit of some kind, pickle, or pastry; or drinking beer, acid wine, or wine of any description in some cases. In all cases, therefore, it may be established as a rule, that the treatment of the attack should be preceded by an active but mild purgative in removal of any offending cause from the bowels. And this should be followed up, or rather—if the part affected be much swollen, or the subject be plethoric, and pain in the head, or about the regions of the stomach and liver, or oppression of breathing be complained of—preceded by, bleeding from the arm to the extent of from twelve to twenty ounces; and after the operation of the purgative, if these symptoms are not relieved, the bleeding may be repeated. After the operation of the purgative, and with a view of exciting the secretions in general, and allaying nervous irritability, a compound of calomel, emetic tartar, and opium—in the proportion of half a grain of the first and a sixth part of a grain of each of the two others—should be taken, and repeated every two or three hours, till bilious evacuations and perspiration are induced; when the following mixture, which will act upon the bowels and kidneys, may be substituted; and thus will all the secretive organs be acted upon in relief of the system: two scruples of carbonate of soda, four drachms of sulphate of soda, one drachm of tincture of colchicum, dissolved in half a pint of water. A fourth part to be taken every four hours, till relief is obtained, when the same compound may be continued two or three times a day, substituting for the water, half a pint of decoction of bark as a tonic. In addition to which, a pill of a grain of calomel

with as much aloes, may be taken every other night, for the more perfect purification of the blood, by the excitement of the biliary and urinary secretions, till health is restored. The colchicum is supposed to influence the secretion by the kidney of urea in particular, which, as I before said, is known to abound in the blood in these cases; and hence the use of colchicum in gout. Till biliary stools and relief are obtained, everything in the shape of solid sustenance should be avoided—the diet being confined to sago, panada, and the like, with diluents, as barley-water, rennet-whey, toast-and-water, and so forth. To the swollen part, if hot, much relief will be obtained by the continued application of rags moistened in tepid water, to a tea-cupful of which may be added a couple of table-spoonfuls of spirits of wine; covering the rags with a towel, to prevent its too hasty evaporation, as no sense of cold should be induced, though immoderate heat in the part should invariably be reduced.

230. The patient, when relieved, should carefully avoid any fresh exciting cause of attack, and do his best, by attention to diet, air, exercise, and the like, to establish a more healthy condition of the blood and strength of the system; avoiding physic as much as possible, and every other debilitating agency—moral causes, as perturbation and anxiety, or too much application of the mind, not being less scrupulously avoided; the latter, indeed, deserve especial attention, as being very frequent causes of attack. In the chronic and erratic form of gout, a pill of calomel and aloes every other night, with three table-spoonfuls of a mixture, consisting of a drachm of tincture of colchicum, the same quantity of calcined magnesia, half an ounce of tincture of rhubarb, and six ounces of infusion of gentian, conjoined with an abstinent diet, will in general prove very successful remedies.

231. SCIATICA, TIC-DOULOUREUX, ETC.; THEIR MORE ESPECIAL CAUSES AND TREATMENT.—Sciatica, tic-douloureux, and other forms of neuralgia are all varieties of the same painful affection of the nerves, but differently located. In addition to the amount of causes originating in derangement of the secretive and assimilative organs, I have mentioned irritation existing in the brain or spinal marrow: this is commonly occasioned by congestion, or rather inflammatory irritation of the membranes of the brain or spine at the origin of the nerves affected; and in other cases, no doubt, the same condition of the membranous sheath of the nerve affected may be the cause, or co-exist.

232. The treatment of these cases should be first directed to

the secretive and digestive organs, taking cognizance of anything that may be wrong in the performance of their functions, and which I have observed is very generally the case, and particularly so in sciatica—in which affection the kidneys are as generally implicated—if not, as they often are, the exclusive seat of the disorder. Should pain be discovered upon examination of the spine or along the course of the nerve, cupping or leeching the part should be adopted, and this should be followed up by hot fomentation and, after it anodyne poultices to the part; and subsequently a blister may be applied if the pain continue. In some cases, which, be it observed, are very frequent, when the cause, we may presume, is malarial—the sulphate of quinine, in doses of three grains every two hours till relief is obtained, will prove an excellent remedy. In chronic cases, should the above means prove unavailing, much benefit may be derived from the carbonate of iron, in doses of two scruples three or four times during the day. In some cases the cold douche directed to the part has been successfully resorted to, and in others the vapour-bath every other day. In sciatica and tic-douloureux a succession of small blisters on the painful part, and the application to the blistered surface of a grain of morphine daily, has, it is said, proved a very successful practice; or an ointment of belladonna instead of the morphine may be substituted. In fine, there are but few cases that may not be successfully treated by the resources of medical science, provided a clear conception of the cause and nature of the disease is entertained, and there exists no positive organic lesion, but which may become developed by long continuance of the disease, and no doubt occasionally is so in cases of tic-douloureux.

233. THE TREATMENT OF CUTANEOUS AFFECTIONS.—Cutaneous affections, excepting those of specific character, are for the most part curable upon the same general principles, namely, the blood's purification and its amendment in quality; conjoined with the use of the vapour or warm bath, and great attention at all times to the most perfect cleanliness of the skin. With the view of increasing the secretive function of the liver and skin—and thus depurating the blood, I know of no remedy more generally useful in these cases than what is called "Plummer's Pill"—a compound of calomel, antimony, and guaiacum, in doses of from three to five grains every night; and if this alone does not fulfil the required purpose, let it be conjoined with a tea-cupful of dandelion-tea twice a day. But to prove successful, these remedies

must be persevered in for six weeks or longer; and a diet largely vegetable should be conjoined—with abstinence from beer, wine and the like. In some cases, the decoction of sarsaparilla will succeed when that of dandelion proves unavailing: the latter increases the secretion of the kidneys, and the sarsaparilla that of the skin. Should these means prove unsuccessful, the arsenical-solution may be found to answer, in doses of ten drops twice a day in half a tumblerful of water—gradually and carefully increasing the dose to thirty drops. If the person be of full habit, or the affection of the skin, wherever it may be, associated with redness, heat or dryness of the part—evincing an inflammatory condition of the blood, the patient in general will be much benefited by bleeding—once, twice, or oftener. And lastly, the insertion of a seton or issue in the arm or leg, and a purulent discharge thus kept up, will often drain off the ill-humours and prove successful, when all other means have failed. Or a blister, applied in the vicinity of the part, when the affection is limited in its character, and kept open, is another remedy of the same useful character. If the disease be, as it generally is—of the blood, local appliances are of very subordinate consideration. If the part affected be hot or inflammatory, the warm bath, a poultice, or other soothing application, as goulard water, may be applied to it. If, on the other hand, it be ichorous, itchy and scabby, a very weak solution of sublimate or lunar caustic will be preferable.

234. GENERAL REMARKS.—Having pointed out what are the most prevailing disorders and diseases of the digestive and assimilative organs, and some affections of the nervous system, consequent thereon, with the principles for their treatment, it will be obvious from the explanation given of them, that it is not swallowing a farrago of medicine—but by attention to diet, air, and exercise, with sufficient bodily and mental repose, abstinence from spirituous beverages, and avoidance of cold, that these disorders are not only to be prevented, but, assisted by a few simple remedies, cured also in the majority of cases. I have, however, hitherto omitted from consideration the higher grades and more specific diseases of the liver, which will now, therefore, become the subjects of our attention.

CHAPTER XI.

OF LIVER DISEASE, AND CERTAIN ASSOCIATED AFFECTIONS
OF THE LIVER, STOMACH, AND BOWELS—CONSTITUTING
CHOLERA-MORBUS, JAUNDICE, DYSENTERY, &c.

235. CONGESTION OF THE LIVER ; ITS PROTECTIVE INFLUENCE.—Referring to what I have already said on torpor of the liver, it will be recollected that I pointed out how any debilitating agency, acting upon the heart and powers of the circulation, must tend to produce a congestive accumulation of blood in the liver ; and that did not a depository or safety-valve of this description exist, we should be in constant danger of apoplexy or of something as bad. Adverting to this arrangement, I must now add a fact, deserving attention, as not only supporting the correctness of these and some other of the views I have taken, but as manifesting another, in addition to the many instances I have pointed out, of harmony and design in our organization, which is, that had the congestive accumulation taken place in any other part of the system excepting the liver, inflammation as a consequence of obstruction to the circulation in the part must have ensued, but which is not the case here, in consequence of the blood circulating in this organ being venous, instead of the more highly endowed arterial circulating in the rest of the organs.

236. Instead, therefore, of the destructive process of inflammation becoming developed by congestion, the comparatively harmless one of torpor of the liver's function becomes a constant occurrence, if serous exudation from the veins of the bowels—inducing diarrhœa or watery purging, does not take place to its relief, which is frequently the case. Inflammation of the liver and bowels does, however, from this cause (congestion), when long continued, occur ; but this is not the rule, but rather the exception to the rule, and of which I shall speak hereafter.

237. THE DEBILITY SO GENERALLY FELT, AND DISORDERS OF THE LIVER, CONSEQUENT ON HEAT OF SEASON.—The congestion of the liver in all cases will be more or less considerable, in proportion to the amount of cause that gives rise to it ; which leads me next to observe, that this offers a simple and satisfactory explanation of the frequency of disease of the liver, bowels, and associated organs, in hot climates ; and in proportion to the minor degree of the same cause—high atmospheric temperature

during the summer season—it explains also the prevalence of the same description of disorders in the climate of Great Britain. Heat, as I have explained when speaking of the climate of India, so rarefies and attenuates the atmosphere and thereby reduces the amount of oxygen inspired, that the sustaining chemical actions of life, and powers of the circulation are very considerably reduced: hence the general sense of debility experienced in hot weather, and the derangements of health, and of the liver in particular from its engorgement, which subsequently ensue. Cold also, by its effects in deranging the balance of the circulation is, in this country, another very frequent cause of liver disorder, as we shall hereafter show*.

238. SYMPTOMS OF TORPOR AND CONGESTION OF THE LIVER EXPLAINED.—Repletion, cold, and mental excitement, in this

* *Estimate of the Reduction of the Heart's Power and Force of the Circulation in the European by the Climate of India, and disease it gives rise to.*—The deprivation of strength, or reduction of electro-nervous power, experienced by the European from the air's attenuation in the climate of India, may be estimated at a quarter less than that enjoyed by him in this country. Thus, assuming that the mean annual temperature of the climate of our presidencies in India is eighty degrees, which is about the truth, and that of England is fifty degrees, say, however, that it is sixty degrees in this country, as being equally congenial; and the man's strength is in the same proportion, or inversely as these two numbers eighty to sixty; or relatively in favour of power in the colder climate as eight is to six, and that the heart's power and the force of circulation is in the same proportion; it follows, if we estimate the quantity of blood to be kept in circulation, or the amount of the blood's resistance to be overcome by the heart's power, as only a fifth part of man's weight, or twenty-eight pounds, (the usual estimate being one-fourth, and his weight as ten stone)—it follows, I say, upon this estimate, that the European upon his arrival in India has an excess of blood over the powers of his circulating system, of one-fourth of this amount, or seven pounds! This is, perhaps, but a rough estimate, but it is sufficiently correct to account for the frequency in India of liver congestion and the associated diseases of the stomach and bowels requiring the use of the lancet; and is explanatory also of the prevalence of similar affections in this country during the hot season of the year. The effect of heat in producing congestion of the liver, is very strikingly exemplified by the practice pursued in Italy, of confining geese in heated apartments and feeding them abundantly, and by these means congesting and augmenting the size of the liver of these bipeds to an enormous extent for the indulgence of the epicure; and that it is to heat alone, this frequency of liver disease in India is attributable, is rendered conspicuous by the fact,—that the canine race—dogs from Europe—which cannot be said to be intemperate (as it is so commonly thought Europeans are in India), almost invariably die in the southern parts of India from abscess of the liver—as I have proved by repeated examination.

country, are the more frequent causes of liver congestion and torpor; the ordinary symptoms of which I shall now proceed to explain. Torpor of function must of necessity follow the blood's retarded circulation through the liver; and with a defective secretion of bile the bowels will be constipated, and headache, the usual accompaniment of this, will follow. But why will headache follow? A peculiarity connected with the blood's circulation in the brain will, I believe, satisfactorily explain this; which is, that the brain being protected by an unyielding bony case, the circulation of the blood in the brain is not to be expedited by the pressure of the atmosphere *ab externo*, as is the case with respect to the circulation in the rest of the organs, on the heart's dilatation and the expansion of the chest. Second therefore to the liver and its associated organs, on every cause of depreciation of the action of the capillaries and of the heart's force, will venous engorgement or congestive accumulation take place in the brain; inasmuch that, as no vacuum or unoccupied space could take place in the cavity of the skull, if the arterial supply of blood, by the reduction of the heart's power, be diminished—so in proportion must the venous blood abound. Hence, I believe, the pain, *malaise*, giddiness, and lassitude experienced; and reason why a glass of wine, under these circumstances of defective arterial excitement, will so frequently relieve these symptoms. And next, from the torpidity of the liver, the blood is but imperfectly purified from its recrementitious biliary particles; the countenance and skin in consequence become sallow from their retention, and the mind, from the same cause, becomes irritable and desponding; the nights are sleepless or disturbed by dreams, and a sense of dryness and heat of the palms of the hands or soles of the feet, with a feverish state of restlessness are often complained of. The stomach participating in the general disorder, its secretion is deranged, and there exists loss of, or a capricious appetite, with thirst. The pulse is often contracted or oppressed; the skin is usually dry, and the tongue in general is furred. A sense of fulness and oppression, and sometimes tenderness of surface, are also experienced about the region of the liver and stomach; and pain too is not unfrequently complained of as existing beneath the shoulder-blades. This leads me to observe, that the substance of the liver I believe to be void of sensibility, or nearly so; and that the pain felt in the side at a more advanced stage of the affection, is owing to the implication of its investing peritoneal covering; and that it is distension

or inflammation of this highly sensitive membrane alone that gives pain to the part at any time.

239. **BILIOUS FEVER, ETC.**—The above symptoms may be preceded by, or accompanied with, a short stage of excitement and increased secretion of bile; as a consequence, probably, of irritation communicated to the biliary ducts by the ingestion into the stomach of some spirituous beverage or other irritant, inducing bilious purging; or, from the combined effect of cold or other deranging and exciting cause, the affection is sometimes attended with a considerable amount of febrile reaction, or associated fever; when it is usually denominated bilious fever.

240. **JAUNDICE.**—I must now mention another affection of no unfrequent occurrence attendant upon a torpid liver, namely, jaundice, characterized by extreme yellowness of the skin, implicating the whites of the eyes and countenance in general, pain in the side, or in the region of the gall-bladder,—often severe, and frequently of a spasmodic character, and extremely torpid bowels. The cause of which in general is—obstruction in the biliary duct—occasioned by a gall-stone or consolidated bile—which is apt to form in the gall-bladder under the circumstance of protracted torpor of the liver, and impact the biliary duct—thus intercepting the flow of bile into the intestines—and hence their torpor, and the suffused yellow countenance from the bile retrograding and finding its way by the veins and absorbent vessels into the general current of the circulation. Or it may be occasioned by inflammation—extending from the liver to the gall-bladder or from the bowels, thickening the duct, and thus impeding the flow of bile into the intestines; or otherwise by the irritation induced by the long-retained and acrid bilious fluid, occasioning spasmodic constriction of the duct and its consequences, pain, &c.

241. Thus viewing this affection—the treatment is obvious in all cases in which pain in the part may be a symptom—to subdue, or prevent inflammation—as in this the danger lies! And, accordingly, commensurate with the pain—a dozen or two of leeches should be applied over the part, and after their removal, with the view not only of encouraging the bleeding, but with that also of relaxing the part, and removing the obstruction—the continued application of hot fomentation to the whole region affected should succeed them; and a pill of a grain of calomel with a third of a grain of opium, and a sixth of a grain of emetic tartar, should be given every two hours. And if there be vomit-

ing, which is no unfrequent symptom, in addition to these means—a large emollient clyster should be frequently administered, and the leeches be repeated every four or six hours, so long as pain in the part shall continue; and when this has ceased and the stomach is retentive, a weak solution of Epsom salts may be given between the doses of the pills, till the bowels become free and the evacuations bilious and natural. In the less acute form of the affection, in which the duct is but partially closed, after the application of the leeches—which should be applied whenever there is pain in the part, an emetic is often a useful remedy—and after its operation, and the part has been well fomented, or a hot bran poultice has been applied—six grains of calomel may be administered, following it up two hours afterwards with a weak solution of Epsom salts in senna tea, till the bowels are relieved, repeating the calomel in less doses every six hours with the aperient mixture, so long as it may be necessary.

242. DEBILITY AND THE SYMPTOMS OF THE CHLOROTIC FEMALE.—A much milder and less prominent affection than any I have yet noticed may occur, the leading features of which are general debility, accompanied with *malaise*, a sallow countenance, and constipated bowels; and often attended with headache, oppressed breathing, or cough, and sometimes a vicarious expectoration. This, I believe to be the condition in general of the chlorotic female, the interruption of the menstrual relief being as often the effect, as the cause of the biliary and general derangement. The secretions in these cases are all disordered, and the blood, in consequence, is deteriorated; hence there is a depraved, or if the congestion of the liver be considerable, (preventing the absorption by the veins of the alimentary fluids from the stomach and bowels,) a complete loss of appetite, with coldness of the extremities; and if this continue great emaciation follows, leading to the belief that the patient is consumptive.

243. EFFECTS OF TORPOR OF THE LIVER UPON THE FEMALE AT A LATER PERIOD OF LIFE.—With females at a later period of life, another train of symptoms flowing out of the same affection, (torpor of the liver,) takes place; based, however, in general, upon the congestion of repletion—succeeding to the termination of the menstrual relief; when, if fat—which becomes now often abundantly formed for the relief of the system, is not generated or is insufficient for this purpose, a vicarious leucorrhœal discharge, or a dropsical state of the abdomen, or disease of the

womb, takes place ; or apoplexy, palsy, or asthma ensues. And the same train of symptoms will ensue at an earlier or intermediate period of life from obstruction of the natural relief.

244. INFLAMMATION, AND INDURATION OF THE LIVER.—Reverting now to the symptoms previously enumerated of more frequent occurrence, and characteristic of torpor of the liver—these may very properly be defined—the first stage of liver disease—or stage preliminary to inflammation of the organ, which now becomes developed in the following way. The retardation of the blood through the liver and the distension of its veins when considerable, necessarily impedes the blood's ingress into them from the capillary arteries, (the liver being furnished in common with every other organ, with arterial blood for its structural endowments and nutrition,)—distension of these vessels, and its consequence, therefore—inflammation, ensues. This may be gradual, as it generally is, chronic and insidious—being attended with little pain, for reasons I have before given ; progressing slowly, though terminating ultimately, in induration or hardening of the organ, or in the formation of matter or abscess in its substance. Or the congestion may be more sudden and considerable ; or, by the exposure of the patient to cold, or from drinking spirituous liquor, or from the previous condition of the blood, or through the conjoint operation of these or other causes—may acute and active inflammation of the organ be at once developed : involving in this case generally, its peritoneal covering, and implicating that also of the midrif, to which the organ is attached—when acute pain in the side is experienced, extending often to the point of the shoulder, and attended with cough, difficulty of respiration, and other symptoms of apparent inflammation of the lungs, with febrile excitement, and active pulse.

245. ABSCESS AND SEQUELÆ OF INFLAMMATION OF THE LIVER.—If the above symptoms of acute inflammation are not soon arrested, abscess of the organ ensues, which is evinced by copious nocturnal sweat, succeeding to shivering and a short stage of febrile excitement ; a sense of throbbing and weight in the liver now often succeeds to the pain in the side ; spasmodic twitches or convulsive startings on going to sleep are occasionally complained of ; the pulse loses its firmness, and becomes soft and frequent ; a copious deposit takes place in the urine when cold ; and the bowels often become lax. Or the case otherwise, lapses into one of chronic inflammation of the organ, with protracted

functional derangement, attended often with a dysenteric state of the bowels, or other disorder of the bowels and stomach.

246. **DYSENTERY.**—In a large number of cases in hot climates, and in hot seasons in this also, instead of inflammation succeeding to congestion of the liver, dysentery ensues; or otherwise bilious purging; or, in other cases, both vomiting and purging of bile—or cholera-morbus takes place. These are all links in the same chain of affection, and are thus brought about. The obstruction to the circulation in the liver resulting from its congestion, necessarily throws back the blood upon, or impedes its current from, the stomach and bowels—and distension of the veins of these organs ensues; occasioning, first increased mucous secretion from the vessels of the bowels in relief of their distension, and subsequently, bloody exudation; from which causes and the accompanying distension of vessels, the bowels are irritated and excited to frequent evacuation; and hence, as long as the symptoms are unaccompanied with those of inflammation and febrile reaction, a sero-muculent purging, or, if blood be also exuded, passive dysentery ensues.

247. These sero-muculent or bloody evacuations, the early condition of dysentery, may last a day or two, or a much longer period—commensurate with the extent of the congestion, and the relief thereof afforded by the evacuations. Or, the acute and active disease, accompanied with inflammation of the large intestines (the seat of the disease) may at once take place, from the combined influence of cold or other cause of arterial excitement; the congestion of the veins of the bowels in this case, as in that of the liver previously noticed, occasioning arterial turgescence of the bowels, and its consequence, excitement—or inflammation. Hence the pain complained of below the navel, which succeeds the scanty evacuations of blood and mucus, with the constant efforts at expulsion; the severe straining and pain at the anus, the dry or clammy skin, the loaded, white, excited tongue, and febrile pulse; attended, if the stomach is implicated in the affection, with sickness of the stomach; and in the more advanced state of the disease, if the bladder or kidneys become involved in the affection—with scalding and difficulty in voiding, or indeed suppression of urine.

248. **SEQUELÆ OR TERMINATION OF DYSENTERY.**—The above symptoms of inflammation of the large intestines, if not promptly and vigorously treated, often run a rapid course and terminate in mortification, which is evinced by the sudden cessation of pain,

prostration of strength, delirium, cold clammy sweats, more fluid, copious and offensive evacuations, hiccapping, vomiting,—and occasionally of coffee-ground-looking matter, cadaverous countenance, and feeble pulse. Or, the inflammation, as in the case of the liver, may be retarded, and the symptoms mitigated, but not cured—the case becoming one of chronic dysentery. In which case, ulceration of the mucous membrane of the bowels takes place, attended with porridge-like muculent evacuations, straining, and protracted constitutional disturbance.

249. **BILIOUS PURGING AND CHOLERA-MORBUS.**—Instead of dysentery and inflammation of the large intestines becoming developed, as just noticed, the distension of the blood-vessels is sometimes more particularly felt in the stomach and small intestines; whereby inflammation becomes developed in the upper or duodenal portion of the latter: hence irritation and excitement are imparted to and extend up the biliary duct which here opens into the bowels, occasioning increased biliary secretion, and its result, bilious purging. The same affection in a higher degree, and implicating the stomach more largely, is attended with bilious vomiting; and hence both vomiting and purging of bile—or cholera-morbus—ensues.

250. The bilious vomiting and purging of the intemperate I believe to be induced in a similar way—that is, by irritation imparted to the duodenum extending to the biliary ducts. And furthermore, it may be inferred, that the suppression of perspiration by cold, and the repression of blood from the surface of the body to the internal organs, would often prove an exciting cause of a similar attack, in persons predisposed to it by intemperate habits; and occasion the same in others having congestion of these organs; and aggravate the disorder in either case; which experience proves to be the fact.

251. **MODIFICATION AND VARIETY OF DISEASE.**—In conclusion, it is abundantly obvious that these diseases are, as I have represented them, all one unbroken chain of effects, arising out of one general cause, and implicating the stomach, bowels, and liver, though in various degrees; and that the symptoms of each may accordingly manifest themselves in single groups, or be otherwise variously combined, as well as modified by the habits of the individual, the season of the year, or other deranging and influencing cause: and hence the number and variety of such affections.

252. **MALARIA ANOTHER DEBILITATING CAUSE, GIVING RISE TO**

DYSENTERY AND LIVER AFFECTION.—In addition to the foregoing causes of dysentery and liver affections, it must, however, be added—that in certain seasons, as well as in certain localities, these diseases are often based upon or connected with a febrile cause—the debilitating and poisonous influence of malaria upon the system. Hence, in localities favourable to the production of malaria, or in seasons in which the intermittent and typhoidal types of fever are prevalent, this fact must be carefully borne in mind—as the chief point of practice in the treatment of these affections of the bowels and liver, developed under these circumstances, is based upon its observance. From the want of this being more generally known and acted upon, I feel no hesitation in saying, many—ay, very many, both in India and in this country also, annually lose their life. The fever in these cases being in general so modified and obscured by the more prominent symptoms of the local affection, as neither to be seen, nor even supposed to exist. But on this very important subject, I shall speak more particularly hereafter.

253. TREATMENT OF TORPOR AND CONGESTION OF THE LIVER.

—The primary link in the chain of diseases of the liver, I think I have pretty clearly made out—to consist in congestion of that organ, and torpor of its function—dependent upon the circulating powers being reduced, or not equal to that of maintaining the blood in free circulation. Bleeding in relief of the oppression, and calomel for the excitement of the liver and the powers of the circulation, are therefore our chief remedies. Accordingly, the former, in relief of the congestion, should be immediately practised, to the extent of from eight to twenty ounces; and repeated, if necessary, at intervals of two or three days, or oftener, till the breathing is perfectly free, and every feeling of oppression about the organ is removed. At the same time, a pill of two grains of calomel and one grain of aloes should be taken every night, or oftener if necessary; and two drachms of Epsom, or Cheltenham salts may be taken every second morning, till the secretions of the bowels are of healthy appearance, and sleep and appetite restored;—when, to prevent a recurrence of the disease, a more abstemious diet should be observed, and as much exercise taken as the patient is capable of, short of producing fatigue; and the cold bath and other appliances should be resorted to in order to strengthen the system, and give vigour to the circulation.

254. TREATMENT OF BILIOUS FEVER.—The simple and r

common affection is here to be understood, in contradistinction to the remitting type of fever with bilious symptoms. The fever in this case is of the simple inflammatory kind—the same as occurs from cold, but associated with liver congestion and derangement; and is attended often with a good deal of cerebral excitement, and sickness of stomach, or bilious vomiting, as well. Bleeding in this case should be immediately practised, proportionately to the excitement, and constitution of the individual: from twelve to twenty ounces may often be taken with advantage, and repeated, after the operation of an active dose of calomel and jalap (three grains of the first with thirty of the last), should pain in the head, oppression of breathing, or tenderness about the liver or stomach, continue. The bowels in these cases are sometimes obstinately costive, which we may suppose attributable to congestion of the brain, seeing that it very generally gives way to the application of a dozen leeches to the temples. A large clyster is therefore often a very useful and very proper auxiliary. The bowels having been effectively relieved, the purging should be followed up by small doses of calomel, in combination with emetic tartar and opium, every two or three hours, till bilious evacuations are freely obtained and the skin becomes perspirable—say twelve grains of calomel with two grains of emetic tartar, and as much opium, made into twelve pills. After the skin becomes perspirable, the case is reduced to one of simple congestion, and requires only a continuation of the pills at longer intervals—two or three times a day—till the secretions are healthy; or a pill of calomel and aloes every night may be all that is necessary, with attention to diet, air, exercise, &c. till health is restored.

255. ADDITIONAL REMARKS.—Upon the subject of torpor or obstruction of the liver, I will add a few observations in reference to debility and the chlorotic state of females. I was consulted some time ago in two cases of great emaciation, torpid bowels, loss of appetite, and coldness of the extremities; in one case, pain of the stomach, and sickness after meals, and in the other, menstrual obstruction and hysterical symptoms were present; no pain in the side was complained of, but headache and despondency existed. These were cases in which small bleedings, conjoined with moderate doses of calomel and aloes, and the use of the warm bath, with air and exercise, would have restored the patients to health: but as the pulse and emaciation, in the estimation of the friends, were opposed to my views, other advice

was acted upon. One of these patients I know to have died; the other, who was taken to the Continent for change, fell into the hands of a physician, who thought he had discovered some spinal affection (and it is very probable that, from debility, some curvature may have existed), and who having, in consequence, applied some leeches to the part, I heard, had done the patient some good. The emaciation in these cases was, to my apprehension, the simple and necessary result of the congestion and obstruction in the liver intercepting the absorption of nutriment into the system from the stomach and bowels; and the sense of cold and debility was the necessary consequence of this—the want, in short, of fresh nutritive matter to maintain the combustion and active condition of the circulating system;—affording indications of treatment quite opposed to tonics, which were the remedies employed in these cases, and are those so generally resorted to under similar circumstances.

256. FEMALE OBSTRUCTIONS.—And now with respect to the obstruction of the periodical relief, to which the sex is so liable, the result of my experience is, that there is no remedy so effectual, as a pill of a grain of calomel with as much aloes and soap, every second or third night. This is not incompatible with the patient's taking at the same time, if there be much weakness complained of or hysterical symptoms, one of the preparations of iron—as a dessert-spoonful of steel wine twice a day, or four or five grains of citrate of iron in a table-spoonful of port-wine as often.

257. TREATMENT OF BILIOUS PURGING.—Should bilious purging, from increased secretion of bile and irritation of the bowels, succeed to congestion of the liver—as is sometimes the case;—from, we may suppose, irritation communicated to the biliary ducts from the duodenum, through the ingestion into the stomach of some irritating substance or spirituous beverage:—congestion of the liver being the basis of the affection, blood-letting is primarily indicated to the extent of from twelve to twenty ounces—or quantity justified by its effects upon the pulse at the time of the operation, and the circumstances of the case; following this up by two grains of calomel in combination with half a grain of opium, every three or four hours, till the purging ceases, or the evacuations, which are in general green and muculent, become healthy;—repeating the bleeding, or leeching the part if there be pain, as circumstances may indicate; and following up the calomel, a suitable time afterwards, with a dose of castor-oil.

258. MELÆNA.—After long-continued congestion of the liver, in certain conditions of the blood and general debility, instead of bile being secreted, the patient will sometimes evacuate a quantity of black, sooty, pulverulent, coffee-ground-looking stuff. This, I believe, to consist of the colouring matter of the blood, the latter, by long retention in the liver, having lost its vital attributes; the discharged matter being, indeed, an exudation, or rather, I fear, issuing from the rupture of the blood-vessels, and not a secretion of the organ. We must look upon this, therefore, in general, as a bad symptom, evincing extreme oppression and defalcation of the secretive power of the liver. Black, tarry-looking, and spinach-like stools, are secretions which have been long pent up in the liver, or in the gall-bladder; and their expulsion may therefore, on the contrary, be hailed, in a general way, as evincing that the case is progressing towards amendment, and that calomel and purgatives are further indicated;—in short, in getting rid of such matter, it will in general be found we are dislodging the enemy, and with it the principal cause of the disease; whereas the evacuation of melæna attends, perhaps, scirrhus (or some condition as bad), and will be followed by dropsy and death.

259. TREATMENT OF CHOLERA-MORBUS.—The quantity of green bilious fluid ejected by the stomach, and evacuated by the bowels, in a case of this kind, is sometimes very great; and the irritation and exhaustion consequent thereon are often extreme. The true character of the disease must, however, be steadily held in view—as one highly congestive of the liver, and which is not unfrequently associated with, or will be succeeded by, inflammation of that organ. Bleeding is, therefore, obviously indicated; but, when the exhaustion is considerable, this must necessarily be cautiously practised, the patient being at the time in the recumbent posture, and the quantity of blood taken limited by its effects upon the pulse—withdrawing it from a small orifice—and repeating the bleeding afterwards every three or four hours, as excitement becomes developed, or as circumstances render necessary. The bilious evacuations—which I believe to be a curative effort of the system, in most cases, for the relief of the oppressed organ—however proper it may be to moderate, should not, therefore, be hastily suppressed. The operation of calomel being modified by the extent of the dose, a large one is here indicated: twenty grains may often be given with advantage, combining it with a grain of opium; and a fourth or sixth part of this quantity, with half a grain of opium, repeated every three or four hours

afterwards. A large mustard plaster should at the same time be laid over the whole region of the stomach and liver, and be kept there for fifteen or twenty minutes. And upon the principle of derivation, advantage will be afforded by immersion of the feet and legs in a pailful of hot water, in which a couple of ounces or more of flour of mustard have been diffused; or, in severe cases, immersion of the whole body in a bath of the same description may be very advantageously practised. The vomiting, if considerable, is best allayed by the occasional administration of a large clyster of thin gruel, in which a tea-spoonful of salt has been dissolved; or, half a drachm of calcined magnesia in a small wine-glassful of water may be given between the doses of the pills, with the same intention.

260. The vomiting and more urgent symptoms being by these means allayed, the liver should now be more particularly examined; and should there be pain or tenderness experienced on pressure, a dozen or twenty leeches should be applied to the part, and when they have done bleeding, a large blister should succeed them;—the pills being continued every four or six hours, till gentle salivation is induced.

261. The symptoms of cholera induced by the ingestion of some poisonous agent or irritant into the stomach—as stale oysters, or other improper article of diet or beverage—and of which bilious vomiting is a curative effort of the system, require but the aid of a few doses of calomel and opium, and the support of light nutritive broths, and occasionally a cordial: a mustard plaster over the stomach also is a useful auxiliary.

262. TREATMENT OF INFLAMMATION OF THE LIVER.—The development of this in the acute form is evinced by pain in the right side, under the margin of the ribs, and extending often with the liver considerably across to the left side, and, by nervous connexion, to the point or blade of the shoulder: this is attended in general by cough, oppressed breathing, hot skin, and excited pulse. I must here, however, observe, that with active disease in the liver, the pulse seldom exceeds ninety-six, and the skin is often but little increased in temperature; excepting in those cases in which the peritoneum and diaphragm are implicated in a greater degree—when the cough and difficulty of respiration are so much the more prominent symptoms—that the case often simulates one of inflammation of the lungs.

263. ACUTE INFLAMMATION OF THE LIVER.—The treatment, adapted to the emergency of the case, (evinced by the pain,

cough, and oppression of breathing,) must be prompt and decisive. The patient should be immediately bled to fainting, from a large orifice, and this should be followed up with an active dose of calomel and jalap—three grains of the one, and thirty of the other; and every two hours afterwards by a solution of one of the saline purgatives with emetic tartar—a drachm of Glauber or Epsom salts with a quarter of a grain of emetic tartar, dissolved in a large wine-glassful of water. After the effective operation of the purgatives, unless the oppression of breathing and other symptoms are materially mitigated, the bleeding should again be practised. Otherwise, the patient should be immersed in a warm bath for half an hour or longer, and afterwards twenty leeches should be applied to the side, and on their removal, (without stanching the blood if the patient is not very much exhausted,) a large warm poultice should be applied; the stomach at the same time should be kept nauseated with the emetic saline mixture. The more active condition of inflammation being by these means subdued—the skin becoming moist and the pulse soft—a large blister should be applied over the affected organ, and this should be kept open. We may now have recourse to calomel in doses of two grains in combination with a quarter of a grain of emetic tartar and the same quantity of opium, every three or four hours, till gentle salivation is induced; observing, at the same time, to leech the anus or bleed from the arm, should the stimulus of the mercury prove too exciting.

264. CHRONIC INFLAMMATION OF THE LIVER.—This, or a less active condition of inflammation, may succeed to the mitigation of the acute disease; or it may succeed directly to congestion of the organ, and not unfrequently occurs as a sequel of fever. Pain, or fulness and oppression in the side is complained of, with feverish and restless nights; and pain of the rheumatic kind in the shoulder, and occasionally elsewhere, may be also present. Continued torpor and derangement of the bowels—a dysenteric state being in some cases complained of; loss of appetite, headache, and contracted pupils: occasionally sickness and oppression of stomach, and pain after meals, are not unfrequent attendant symptoms, as well as an oppressed or contracted, and slightly increased frequency of pulse, dry skin, furred tongue, and sallow countenance. These, wholly or in part, are the principal symptoms. The treatment consists in bleeding to the extent of from twelve to sixteen ounces, and the administration of a pill of two grains of calomel, with a quarter of a grain of emetic tartar,

two or three times a day ; and a saline purgative, as two drachms of Epsom salts, every second morning. And if it can be conveniently done, the patient should be immersed in a warm bath for half an hour or longer every evening, or otherwise the side should be well fomented with hot water twice a day. The bleeding should be repeated in a day or two, and this be followed up by the application of a dozen leeches to the anus, and as often after as necessary—that is, till pain and oppression are completely removed. A blister should also be applied to the side, and after the surface has healed, should be repeated ; or a seton should be inserted in the side, and kept open. On the gums becoming tender, the pills should be taken less frequently, but should nevertheless be continued till gentle salivation is induced, and the gums kept tender by the same means afterwards for some time, till the healthy function of the organ is pretty well established. After the blister has healed, if the seton be objected to, half a drachm of mercurial ointment may be daily rubbed in upon the side for half an hour or longer, and a purgative of jalap or senna administered every second day, instead of the calomel ; and salivation, or tenderness of the gums may be induced in this way.

265. DYSENTERY.—The characteristic symptoms of dysentery are a sanguineo-muculent flux from the bowels, frequent desire and attempts at evacuation, and severe straining ; with pain about the navel, and also very generally at the anus ;—effects resulting from the blood's stagnation in, or impeded current from the veins of the bowels in its passage through the liver, by which increased mucous secretion and sanguineous exudation into the bowels take place ; and from the congestion of the liver which occasions it, it is not unfrequently associated with inflammation in that organ ; or otherwise, inflammation of certainty exists in the colon or large bowels. The treatment is, accordingly, blood-letting in relief of the congestion of the liver and distended veins of the bowels and their attendant inflammation ; in conjunction with mercury to excite biliary secretion and increase the circulation through the liver. With these intentions, from sixteen to twenty ounces of blood should be immediately taken from the arm, and twelve grains of calomel be administered, following this up two hours after with an ounce of castor-oil. After the operation of the oil, twenty leeches should be applied to the abdomen, and repeated every six or eight hours afterwards in numbers proportionate to the necessities of the case—with reference less to the pulse than to the straining complained of—the scantiness of the

evacuations—their frequency—and the blood they may contain ; as well as pain at the anus, or pain on pressure beneath the navel or along the course of the colon, and in the situation of the cæcum. Administering, at the same time, three or four grains of calomel, with one grain of ipecacuanha and a third of a grain of opium in pill, every three or four hours till a bilious stool is obtained—which, marking the liver's return to duty, and the removal of obstruction, is attended with marked relief to the patient ; and as the influence of the mercury becomes more apparent on the system, so is the amendment progressive. When the gums become tender, or rather when salivation is induced—which in these cases is the object to be held in view—the pulse in general becomes full and energetic, the surface healthily excited, the spirits buoyant, and straining and evacuation, and every other distressing symptom, vanish.

266. Should the patient not have come under treatment sufficiently early to justify the active bleeding we have advised, or in a less severe form of the disease, twenty leeches should be applied to the abdomen, and repeated as often as necessary ; and after their removal, the patient should be immersed in a warm bath for twenty minutes or longer ; or if this be not available, the abdomen should be covered with a bran poultice, or frequently fomented with hot water ; the pills at the same time should be given every three or four hours according to the exigencies of the case, and warm emollient oily clysters may also be administered occasionally, should on trial they afford relief. The diet in all these cases should be confined to sago, arrowroot, or barley-water, with milk, and limited to a few spoonfuls at a time, though it may be as frequently given as desired.

267. Should the inflammation have been of the active kind, and not be subdued during the first three or four days of the disease, mortification of the bowels will probably ensue, which is evinced by the sudden cessation of pain and straining, offensive watery evacuations, hiccupping, delirious wandering, and general prostration. When this takes place, the object is to support the declining powers of the system by wine and nutriment, to soothe the patient by opium, and palliate symptoms as they arise.

268. CHRONIC DYSENTERY.—Instead of mortification ensuing as a sequel of the acute stage of the affection, it lapses in some cases into the chronic form of the disease ; the patient having six, eight, or more, muculent and more or less feculent evacuations,

tinged with blood, and attended with straining, in the twenty-four hours. The evacuations are often yeasty and of porridge-like appearance, and more frequent during the night than in the day. The treatment of these cases, in which the mucous membrane of the large intestines is in general ulcerated, must be of a modified character. The irritation of mercury upon the system is to be avoided, though attention should be paid to the secretion of the liver. Blistering the abdomen is often of great benefit, as well as the occasional application of a few leeches to the anus, in relief of the straining. The balsam of copaiba, in doses of half a drachm or more three or four times a day, is also another useful remedy, conjoined with an opiate at night. In other cases, a grain of the sulphate of quinine in pill, three or four times a day, and an opiate at night, will succeed better. Immersion in a warm bath for half an hour or longer daily, is a useful expedient; and flannel clothing desirable, with a diet nutritious but not too exciting.

269. A chronic dysenteric state of the bowels is a frequent attendant upon an indurated state of the liver, or abscess in that organ, and symptomatic also of chronic inflammation of the organ.

270. DYSENTERY WITH REMITTENT FEVER.—I must now draw attention to the very important fact already noticed, that in localities favourable to the production of malaria, dysentery and gastro-enteritis are often based upon or connected with fever of the intermittent or typhoidal type; the fever in such cases being often so masked and obscured by the more prominent symptoms of the local dysenteric or gastric affection, as wholly to escape observation. But when the attendant is fully awake to the probability of such an occurrence, attention will discover periods of remission and exacerbation in the symptoms—either in the attending fever, as marked by the frequency of the pulse and the temperature and condition of the skin, or in the bowel affection—exhibited by pain and frequency of evacuation or of vomiting and stomach affection.

271. In all cases therefore where the amendment is not equal to the measures which have been pursued, and especially so in the season or place in which intermittent and typhoidal fever prevails, there will be strong grounds for suspecting its existence. Should this be detected, the treatment must immediately assume a very different character, the disease being one intrinsically of fever, exciting inflammation, and developing the dysenteric or stomach affection—in those in whom there pre-existed congestion

of the liver and bowels, or predisposition to the disease. In such cases, the primary indication of treatment consists in superseding the influence of malaria on the system, or the febrile cause which has given rise to the affection, by the administration of the sulphate of quinine, in doses of a grain or two every two hours; after a few doses of calomel have been taken, conjointly with bleeding or leeches once or twice in relief of the local affection, if these means have not been previously adopted. The quinine must be followed up, after the fever has been arrested, by calomel in moderate doses, with the occasional application of leeches to the anus, in relief of the pain, or straining, or sickness of stomach, should these symptoms still continue, till the gums become tender.

272. INFLAMMATION OF THE PERITONEUM.—The peritoneum, or membrane enfolding the organs within and lining the abdominal cavity, sometimes, from exposure to cold or other cause, becomes inflamed; in which case there is acute pain, or spasm, with heat and tension pretty generally diffused over the whole extent of the belly; the patient in general preferring to lie upon the back, and not unfrequently to draw up his knees, so as to relax the muscles of the abdomen and membrane within. The inflammation may extend and implicate the organs invested in this membrane, and thus the stomach may become inflamed by implication, and vomiting be induced, and in like manner may the bowels be affected, and constipation occur. And contrariwise, the organs may be severally and primarily influenced, and secondarily affect their outer and investing covering, and thence may the inflammation be extended to other portions of the membrane, and dropsy by effusion take place.

273. TREATMENT OF INFLAMED PERITONEUM.—The treatment must necessarily bear reference to the cause of the disease, whether it be primary in character, or secondarily induced. In the first instance, bleeding must be practised commensurately in amount to the extent of the inflammation. If the pain is considerable, the tongue white, with red edges, and the pulse frequent, tense, and wiry, the patient should be bled to faintness; and after the bowels have been freely relieved by an ounce of castor-oil, followed by an emollient clyster, twenty or more leeches should be applied to the abdomen. After the leeches have been removed, and without stanching the bleeding, the abdomen should be wholly covered with napkins wrung out in tepid water, which should be renewed occasionally, or a bran poultice may be applied. The pills which I have previously advised in other varieties of

inflammation, of calomel, emetic tartar, and opium, should also be administered every two or three hours (made in the proportion of twenty grains of the first, with two grains of each of the other articles, into twelve pills) so as to keep the stomach slightly nauseated, and continued, commensurately with the severity of the symptoms, till the gums become tender, or perspiration and relief is obtained: keeping the bowels free, at the same time, by an occasional dose of castor-oil, or an emollient clyster; and repeating the leeches, or bleeding from the arm as circumstances may render necessary. Peritoneal inflammation may, however, be based upon uterine inflammation, and associated with typhoidal fever, in which form it sometimes attacks women after childbirth, and the inmates more frequently of lying-in hospitals. The disease and its treatment will be modified materially by this circumstance, as in the analogous case of dysentery previously treated of, and will be noticed hereafter when treating on typhoidal fever.

274. DROPSY OF THE ABDOMEN.—This, I am of opinion, is in all cases, with the exception of those originating in congestion, dependent upon, or connected with inflammation of the peritoneum in a chronic form, succeeding either to the affection just noticed of primary or idiopathic inflammation, or more frequently to inflammation of one or more of the organs—as the liver, spleen, bowels, or kidneys; the liver perhaps more frequently—and extending from within the organ to its outer or peritoneal covering, and thence implicating this and other portions of that membrane. In general it is not, therefore, a primary, but a secondary affection, of disease of these organs, and as such it should be considered, and treated accordingly. The infiltration of water (the serum of the blood) into the cavity of the abdomen, marks the sequel of inflammation of the peritoneum—that is, the exudation of relaxation which succeeds to unsubdued inflammation; if it do not occur from simple congestion. The indications of treatment obviously bear reference to the cause—the inflammation or disease of the organ especially affected, and that of the membrane which has resulted from it. With the intention, then, of remedying this—bleeding, whenever the pulse will at all admit of it, is a remedy of first-rate importance, not only with the view of subduing inflammation or removing congestion, but with the further object of aiding in the absorption of the effused fluid—the fact being established that absorption takes place throughout the system in the inverse proportion to the distension of the blood-vessels; and hence the reason why, increasing the urinary secre-

tion tends so much to reduce dropsical infiltration, wherever located. With these intentions, small bleedings should be frequently practised, and the liver and kidneys be excited to increased duty, by a combination of calomel with diuretics. By these means, the bowels and kidneys being kept in active operation, freedom of breathing will be preserved, which otherwise soon becomes oppressed, and the head in consequence affected,—the distension of the abdomen not allowing the descent of the diaphragm and expansion of the lungs. And of all diuretics digitalis is unquestionably the most useful, combining it and the calomel in a pill with a little aloes and squills, in the following proportions:—Calomel, squill in powder, and aloes, of each eight grains; digitalis powder four grains, made by the addition of a little soap, into twelve pills; one to be taken every six hours. Should these not fulfil all the purposes desired, a third part of the following mixture may be taken conjointly, between the doses of the pills. Infusion of senega six ounces, liquor of acetate of ammonia two ounces, nitrous æther two drachms—mix. On some occasions, to this mixture may be added thirty drops of tincture of cantharides; or instead of the pills first named, forty drops of the tincture of digitalis may be added to the mixture, and the bowels be kept open by taking every other night a pill of two grains of calomel with as much aloes. When the powers of the system are not too much exhausted, in furtherance of the relief of the system, the hot-air or lamp bath may be very advantageously conjoined, and a blister applied over any organ affected. The powers of the heart and the system may sometimes require the support of a little wine, and such nourishment as may be most agreeable to the patient; the abdomen being at the same time bandaged—the compression of the organs within favouring the return of the blood to the heart, and aiding in the absorption of the fluid. And a tonic may subsequently be required, as the decoction of bark with one of the mineral acids,—and in some cases, those especially succeeding to scarlatina or other form of fever of the remittent type, is often indispensably requisite, in conjunction with the diuretic and other remedies more particularly bearing upon the dropsical affection.

CHAPTER XII.

ON THE DISORDERS AND DISEASES OF THE RESPIRATORY ORGANS AND CIRCULATING SYSTEM; OR AFFECTIONS OF THE LUNGS, SKIN, WIND-PIPE, AND AIR-PASSAGES:—INDUCING COUGH, COLDS, PLEURISY, RHEUMATISM, CONSUMPTION, ASTHMA, AND FEVER.

275. SKIN AND LUNGS UNITED IN DISEASE.—The function of respiration, I have before said, is not confined to the lungs, but is participated in by the skin also; and as these organs are associated in function, so are they similarly subjected to the same causes of derangement; at least, so far as exposure to alternations of temperature, and other vicissitudes of the surrounding air, are concerned in influencing them. Accordingly, the skin, as far as it is associated in disorder with the lungs, and deranged in function by the same causes, will be the subject also of our attention in this chapter.

276. It would appear, exposed as the lungs and skin are at all times to atmospheric influence, and seeing the perpetual mutations and numerous perturbing agencies to which the atmosphere in our extremely variable climate is subject, that the respiratory organs must be constantly liable to disease. But the function of respiration is so pre-eminently important to the system, that Nature, with her usual conservative providence, has so endowed the lungs as in a considerable degree to protect their function from the influence of these deranging causes; as I shall now briefly point out.

277. PROTECTION OF THE LUNGS.—The capillary vessels of the lungs, in which the conversion of the venous into arterial blood—the all-important purpose of respiration—is effected, in the first place, are not the highly endowed susceptible vessels which have the offices of nutrition and secretion to perform (like the organic capillaries or those of the general system), no, but are of the passive venous character—the simple physical requirements of their existence being, by their minute subdivisions, to expose every atom of the blood circulating through them to the influence of the air—by which, in the air-cells they are surrounded. Whereby the blood, propelled by the heart's contraction, and

distributed through these vessels, exhales or parts with the carbonic acid gas it contained: and again, on the heart's dilatation which immediately succeeds to its contraction, draws back the blood from the lungs enriched with the air it has imbibed to the other side of the heart, for general circulation. At the same time, it is deserving of notice, that for the further security of these vessels—that is, in order that their temperature should not be liable, from the admission of cold air into the lungs, at any time to any very sudden reduction—the exchange of air upon each act of respiration is equal to no more than a fifth part of the quantity contained in the lungs under the ordinary circumstances of respiration (some say it is but a twelfth part): and again, the inspiratory movements being in the proportion of but one to four of the heart's action, there is a constant influx into the lungs of warm-blood to maintain the temperature of these vessels. These are all very important provisions to secure the capillary vessels of the lungs against any sudden reduction of temperature, to which they would otherwise be exposed. By the exchange too of but a portion of the air, we are, moreover, preserved from the possibility of being poisoned—to which we should have otherwise been liable by a single inspiration of the more noxious gases; and against which, the sense of smell intended for our protection, would have afforded no security. The feeling of cold experienced by the skin, is another provision, intended for the protection not only of the skin, but also of the lungs. We should, therefore, always attend to Nature's admonitions, and avoid cold, and especially draughts of air, using exercise to counteract its influence when unavoidably so exposed, and retire to a warmer situation as early as may be afterwards, taking care at the same time to avoid any great or sudden transition. Nature, for the protection of the lungs against cold, has also interposed another expedient—that of the air's admission into the cells of the lungs being through the protracted route of the warm nasal passages, the throat, and air-tubes, and thus tempering it on its passage. In short, we see her hand interposed in so many ways for our protection and guidance, that we are constrained to exclaim with the Psalmist—"O God! how great and wonderful are thy works: in wisdom hast thou made them all!"

278. EFFECTS OF COLD UPON THE LUNGS AND AIR-PASSAGES.—In despite, however, of these numerous provisions for our protection and guidance, we, too often from presumption, or neglect of Nature's admonition, subject ourselves to disorder and disease

from cold—which thus gives rise to catarrh (the affection of the nasal passages usually called cold in the head), sore-throat, cough, and the severer forms of affection—inflammation of the wind-pipe, bronchi or air-tubes; or of the lungs in their entire substance; or of the pleura—or membrane enfolding the lungs and lining the cavity of the chest. These several affections of the lungs, their membranes, air-tubes, and passages, being all dependent on one and the same cause, are necessarily allied in character, and may exist either singly or conjointly, according to the extent, or severity of the cause, the particular circumstances of exposure, the condition of the blood, the susceptibility of the parts, and the constitution of the individual attacked. Cold in its effects—commensurate with the amount, and the above-named circumstances, in giving rise to catarrh, sore-throat, or cough, acts in the same way, but in a minor degree, or to a less extent than, when it induces the severer affections of inflammation of the lungs, air-tubes, pleurisy, or the like affections. Congestion or irritation being thus induced, and occasioning those complaints, in contradistinction to the severer affection or inflammation of these parts,—the *quo modo* of which I shall now explain and exemplify, by describing the effects of cold on the nasal passages. The skin of the face in its continuation into the nostrils, becomes, as it does in all other cases of like import, denuded of its outer covering, and is thus converted into a mucous membrane—having now to secrete a mucous fluid for the maintenance of a moist surface, essential to the higher endowments of its nature and relative position. The effect of cold then, in a limited degree, upon the membrane lining the nasal passages, is to act indirectly as an irritant, and thereby to excite and increase its mucous secretion, in the same way that a pinch of snuff directly acts upon the same surface. Thus we find, that going out into the cold air is attended with the frequent necessity for the use of the handkerchief, the quantity of mucus secreted in ordinary being only sufficient to maintain a moist condition of the nostrils.

279. The eyes also often weep on the same occasions, from the same cause—the eyelids being in like manner lined with a mucous membrane, and the small gland situated in the upper lid and near the inner angle, destined to secrete a watery fluid—tears, for the maintenance of a moist surface and to wash the globe of the eye, being thus irritated and excited to increased secretion. So likewise the eye waters or is excited to increased secretion by any foreign irritant—as a particle of dust, which the wind or accident

may have introduced beneath the eyelids, and which, the increased secretion of tears is intended to wash out—manifesting another instance of the *vis conservatrix naturæ*, which we find at hand upon all occasions for our protection. In like manner as snuff introduced into the nostrils, excites increased secretion of the mucous membrane to wash it off, and sneezing for its rejection.

280. INFLAMMATION DEVELOPED BY COLD.—Reverting to the operation of cold on the nasal passages, a greater degree of cold than we have already alluded to, torpifies and arrests the vital endowments of the part—the temperature not being sufficient to support the chemical action which should be maintained in the blood circulating in its capillary vessels. The secretive function of the membrane becomes accordingly arrested, and as the blood is at the same time impeded in its passage, (capillary action being essential to its progression,) congestion of these vessels takes place, and exudation follows—that is, the more watery parts of the blood transude from these vessels to their relief—and hence the copious watery discharge which takes place from the nostrils under these circumstances, and which continues as long as the individual is so exposed. But immediately he comes into a warmer atmosphere, chemical action is again excited in the blood of the part, and the arterial trunks of the capillaries, from distension and increased susceptibility to impression, are now excited into increased action—and hence the heat which now takes place in the part, and the condition of irritation which follows. If the cause has been of long duration, and the excitement is considerable, inflammation, with dryness of the part, succeeds: the hurried circulation of the blood through the vessels, together with the derangement of their function, not admitting of the usual changes connected with secretion being effected. As the inflammatory condition subsides, that of irritation and increased secretion follows—copious and watery in the first instance, but gradually becoming less abundant and more natural as the healthy condition of the part is restored.

281. INFLAMMATION OF THE EYE.—The same effects, modified in character by the function of the part, constitute inflammation, wherever it may exist; and this admits of ready exemplification in the case of the eye. Cold or other irritant first excites a slightly bloodshot state of the covering membrane of the eye, and increased secretion. This is followed, if the cause is aggravated, by a more bloody-looking and congested state of the vessels (vessels which at other times, from their extreme minuteness,

are perfectly invisible,)—and this, again, by increased sensibility, heat, and dryness of the part, or in other words, by inflammation*.

282. COUGH, COLD, SORE-THROAT, PLEURISY, AND INFLAMMATION OF THE LUNGS, ALL MODIFICATIONS OF THE SAME DISEASE.—The same effects follow, though in general more moderate in degree, from the parts being less exposed to the influence of cold, and more warmly endowed by approximation with other parts,—an extension of the affection of the nasal passages by continuity of the mucous membrane, to the throat, wind-pipe, and air-tubes, occasioning sore-throat or cough: or, if in a more aggravated degree—inflammation of the throat or of the wind-pipe, bronchi, or lungs takes place; or of their investing membrane the pleura, and then called pleurisy. The latter, however, we may suppose to be more frequently associated with the effects of cold upon the skin, or more direct influence of cold upon the parts subjacent thereto, thus acting upon the pleura, or membrane lining the chest.

283. THE PRINCIPLES OF TREATMENT THE SAME IN ALL CASES, BUT COMMENSURATE WITH THE EXTENT OF THE DISEASE.—With this explanation of the diseases of the lungs, their membranes and air-passages, it is obvious, that the indications of treatment are alike in all cases, though commensurate in kind, as well as in degree, with the character of the part and extent of the disordered condition. The root of the whole is obviously one of inflammation—more or less in amount—or condition closely bordering on it—and thus giving rise to these various affections, which are active in kind, or passive in degree, in accordance with the circumstances of the case. The cause, it is further obvious, must, in most cases, more or less implicate the skin also, and especially so when inflammation of the lungs or of the pleura is developed, thus occasioning the disorder of its function as a secretive and respiratory organ; with its usual manifestations, namely—heat of skin and accelerated pulse—or fever—the phenomena of which, I shall now explain.

284. FEVER: ITS SYMPTOMS AND DEVELOPMENT.—The primary

* Mr. Travers, in his work on the "Physiology of Inflammation," makes the following observation:—"The first effect of a drop of a stimulant fluid, or a wound or other irritant upon the transparent web of a frog's foot, is seen under the microscope, to arrest the circulation in the part,—the vessels are dilated, and in proportion their fulness is increased, and their colour heightened; but surrounding the stagnant centre, increased activity of the circulation prevails."

motions of life and the blood's circulation, it will be remembered, is capillary action, excited by the caloric and electricity developed by certain chemical combinations and changes which take place in the elementary constituents of the blood, in the vessels of its circulation. Fever is an excited or preternatural action of the capillary vessels, and may be developed by various causes, which, with few exceptions, are primarily of depressing agency. Cold is a frequent one—the influence of which, in developing reaction and fever, I have already explained: observing, that the effect will be various in character and degree, in proportion to the amount of cause or disturbing influence on the capillary circulation, the condition of the blood, and fulness of the vessels in general.

285. The immediate effect of cold upon the surface of the body, is to rob the capillaries of the part exposed of a portion of their caloric, and thus reduce their temperature below the point compatible with the perfect exercise of their functions. The circulation of the blood through these vessels is therefore retarded; by which retardation, the primary series of these vessels, their arterial origins, become distended; and further, as certain chemical changes now take place in the blood retarded in its passage from the arterial vessels, which should have taken place at an ulterior or more advanced stage of its circulation, these vessels, which are more vitally endowed than the veins, and especially so in their capillary extremities—become preternaturally excited, with a view to the relief of the oppression and removal of the obstructing cause.

286. This illustrates the ordinary reaction and glow of heat which follows the cold-bath or other brief exposure to cold. These views, although very difficult to prove, are fully borne out by deduction and the experiments of Sir Astley Cooper and Mr. Coleman; who found that, although venous blood is at first the hottest, arterial blood, when retained in its vessels, progressively became the hotter of the two. The chemical combinations taking place and development of heat, are obviously therefore progressive in the blood; which at once offers a satisfactory explanation of the cause of arterial excitement whenever the blood is retarded in its passage through the capillaries, as I have shown it to be in the above instance; and which the experiments of Mr. Travers on inflammation fully corroborate.

287. To the explanation afforded of the reaction produced by cold upon the surface of the body, I would add, to produce

fever, augment the amount of cause, or cold, to the extent of arresting the perspirable secretion, when the consequences will not only be the retardation of blood in the capillaries and congestion in a greater degree, but, by the retention in the blood of the elements of the secretion, (which, as effete matter, should have been thus expelled,) the blood's pollution also; and this acting as a depressing agent upon the capillaries of the system at large, and thereby depreciating the heart's action, congestion of the veins necessarily follows, with sense of chilliness and depression,—and subsequently, excitement of the arteries or fever ensues—characterized by increased frequency of pulse, with augmented heat and sensibility of the surface, and often also with throbbing and pain in the head. The condition of the capillaries in this case is in reality, as I have elsewhere explained, that of *irritation*, in contradistinction to inflammation—which is, I repeat, the same in kind, but, being limited in the extent of its operation, is much more active and concentrated in degree.

288. CONGESTIVE FEVER.—Should the cause, however, be more aggravated in degree, or exposure to cold be longer in duration, the morbid influence will extend from the surface to the subjacent tissues, and will retard capillary action in those parts also, and inflammation of some of the internal organs will ensue. Or the patient may be in a state of inanition, or the blood be in a condition less favourable to the development of excitement, when instead of increased capillary action and excitement of the system, depression of the heart's power and of all the functions will follow. The heart in this case being enfeebled and oppressed, congestion of blood in the bowels and liver, for reasons I have so repeatedly given, and other remote parts of the circulation, will ensue; a sense of fulness and oppression about these organs will be complained of, and in some cases exudation from the congested veins of the bowels, for their relief and that of the associated organs, will take place; and hence the frequency of diarrhœa from cold, as I have previously pointed out. The stomach will also in many cases be sick from distension of its veins, as well as from indigestion from defect of excitement of the organ; and from congestion of the brain, giddiness and headache will follow; and from the same cause implicating the spinal marrow, muscular pains will often be complained of. And from this again, or the cold's influence extending to the vessels of the muscular fibre, are the symptoms of shivering and cold to be explained; and from

same causes conjoined with the debility which succeeds to defect of excitement are the sense of malaise, feebleness, and weak pulse, which constitute the early stage of the severer forms of fever, to be explained. The symptoms of excitement become in this case developed by the venous congestion which implicates more or less all the organs—withdrawing so much blood from general circulation that less blood is transmitted to the lungs—and the consequence is a more hurried respiration, and as absorption from the lungs takes place in the inverse proportion to the distension of the blood-vessels, an increased quantity of oxygen is absorbed—inducing a more vivid combustion, and its consequence—excitement of the system; and developing but too frequently inflammation in those organs more particularly congested, or in which predisposition exists, or susceptibility of structure disposes, to be thus affected; and more or less in degree, according to the condition of the blood, or other circumstances of the like nature.

289. FREQUENCY OF FEVER: ITS CAUSE.—From the foregoing explanation of fever, it is obvious that any other depressing cause—limited in degree, besides cold, in its effects upon the circulation, may produce the same result. Hence the universality of fever,—malaria, indiscretions in diet, derangements of the secretory organs, and a variety of agencies disordering the blood and depressive in their character, producing the same effects. The cause, however, must be limited in degree, or the result will be *poisonous* to the capillary vessels; or, in other words, the blood will be so depressive in its character, or deteriorated in quality, that the chemical changes in its composition upon which life is dependent, will be altogether arrested, as takes place in the ordinary cases of poisoning by prussic acid or the like agents. Or if the blood be not deteriorated to this extent, capillary action will nevertheless be diminished, below that point which is compatible with the development of the reaction of fever. When in such case it often gives rise to other symptoms of curative tendency by evacuation, as in the case of cholera, and the vomiting and purging which so generally attend poisoning. And indeed so richly provident is Nature—that by the congestion which more particularly takes place in the veins of the stomach and bowels, the absorption from these organs of poison—should that have been the cause—is now further arrested; and, by the exudation that ensues into these organs and the vomiting and purging that follow,—its expulsion, if there remain

any, is effected: the blood too is purified by the same agency, and the vomiting, giving excitement to the liver, is further conducive to this end, as well as to the excitement of the heart, the brain, and the respiratory function, in relief of the system.

290. These are all beautiful provisions of the system—displaying the handywork of Nature—brought into operation at all times and in all emergencies of the system; and if not exactly directing us what we should do in all cases, yet imparting in general some very useful information for our guidance.

291. TREATMENT OF THE SIMPLE FORMS OF FEVER.—Now, what are the indications of treatment in the simple forms of fever? If from cold we may reply, to restore the secretion of the skin, or that principally (remembering that other secretions may also be arrested by the same agency), and remove the effects which have ensued from its suppression. The first object can only be effected by moderating the excitement of the system—the circulation being in this case, as in the like affection of the nostrils from cold, too active to admit of secretion taking place. This is a fact well exemplified in another variety of fever dependent upon a very different cause, namely, malaria, with which the blood becoming contaminated, a sense of extreme cold, shivering, and great depression of the powers of the system, and congestion, ensue; symptoms which are succeeded by high febrile excitement;—and in this case, as the excitement moderates—the reaction being quite secondary—perspiration follows, and is often copious in the extreme, seeing there has been no previous specific torpor or depression of the function of the cutaneous capillaries, as in the former case.

292. OPERATION OF REMEDIES.—The next consideration is, how is this general excitement best moderated? A warm, but not hot bath at once suggests itself, from its power of diminishing the action of the capillaries by absorption of the water and the relaxation of the cutaneous surface exposed to its influence; but to its successful employment, the immersion should be continued for half an hour, and it should be repeated every three or four hours, till the purpose is fully accomplished. The same purpose may be attained by the continued application of a cloth previously wrung out in hot water and surrounded by flannel, to the whole of the abdomen; renewing it occasionally, if dry or cold, in accordance with the feelings of the patient. As in like manner the skin partially exposed to cold will often develope fever, so may its being partially influenced by a bath in this way remove it. Another method of moderating excitement is the one so

frequently practised, namely, that of introducing a remedy into the blood which will diminish the amount of its chemical action, or otherwise influence the function of the organs affected. The first is the mode of operation of some descriptions of saline mixture in these cases, and the last that of antimony, ipecacuanha, and opium—all of which act directly by influencing the blood by admixture with it in reducing chemical action, or exciting the skin's function.

293. RHEUMATISM, SCIATICA, ETC., DEVELOPED BY COLD.—The effect of cold, however, in too many cases, is not confined to the cutaneous surface, its influence being extended to the subjacent and inward parts: thus, in the case of the chest, when, perhaps, more particularly exposed, developing inflammation of the pleura, pericardium, or lungs; in other cases, implicating more particularly the lining membrane of the abdominal cavity, and thus developing inflammation of the peritoneum; and in others, inflammation of the bowels, kidneys, or other organ predisposed, or more particularly susceptible to attack: or, in the case of the limbs, inducing congestion, with irritation, or inflammation of the sheaths of the muscles, or covering membrane of the joints; and thus rheumatism, active or passive, acute or chronic, is induced: or affecting, in some cases, more particularly the sheaths of the nerves, and thus inducing sciatica and other forms of neuralgia; or, it may be, the membranes of the spinal marrow, occasioning similar affections, as well as spasms or cramp, or convulsions; and, indeed, locked jaw, or apoplexy, may be thus induced. Most of these are common effects of cold, directly or indirectly brought about, by its operation on the system, or a part, under different circumstances of exposure, constitutional tendency and condition of the blood, or state of the system at the time of attack. These, too, modified by circumstances, may occur in single groups, or be otherwise variously complicated, and hence the number and variety of nervous, as well as inflammatory affections arising from cold.

294. TREATMENT OF INFLAMMATION OF THE LUNGS AND BRONCHI.—Reverting to the subject—from which we have so long digressed, of the affections of the air-passages induced by cold, and of inflammation of the lungs and their membranes,—we shall now, from our knowledge of fever, be able to determine what are the indications of treatment in every particular instance. As the severer affection will necessarily embrace the milder, from which it differs only in degree, we shall treat of inflammation of

the lungs and of the bronchi in the first instance. The symptoms of which are pain in the chest, cough, hurried, or oppressed breathing, a dry nostril, attended with the usual symptoms of fever—heat of skin, and increased frequency of pulse. These are the especial symptoms; and now what are the indications of relief? As the symptoms are obviously dependent upon excess of excitement, both local in the parts affected, and general in the system,—marked by the increased sensibility or pain in the part affected, and general heat which obtains; the moderation of excitement and restoration of the secretion of the skin are obviously the chief ends to be accomplished. As excitement, if allowed to progress, or if not kept within limited bounds or moderated, will be productive of certain changes in the blood, or in the condition of the part more particularly affected, which will be destructive to its organization, or otherwise materially alter the normal endowments or healthy condition of the part: hence, in the case of inflammation of the lungs, there occurs an exudation of lymph, and its deposition within the lungs' texture, solidifying its substance, and thus closing the air-cells, and lessening thereby the admission of air. This is, I have no doubt, a curative effort operating to diminish excitement, and may therefore be well accepted as a finger-post for our guidance. Or in the case of inflammation of the bronchi, or rather of their lining membrane or that of the air-tubes—this membrane becomes thickened in substance, and its mucous secretion increased, and in this way the absorption of air is diminished, and excitement is moderated. Observing Nature, therefore, the indication is clearly pointed out to us, to moderate excitement; and with this to restore the secretion of the skin, which has given rise to it. And accordingly the warm-bath, the tartrate of antimony with opium, saline mixtures, bleeding, blisters, and diluents, are the remedies indicated.

295. GENERAL TREATMENT.—I recommend, therefore, that bleeding, whenever there is pain and oppression of breathing, should be at once put into practice, to the extent of withdrawing from the arm from eight to sixteen ounces of blood, according to the age and strength of the patient; and repeating the same in suitable quantity, during the first three days, at intervals of six or eight hours, if the other measures pursued during the period are not equal to the necessities of the case. Immersion in the warm-bath when available for half an hour or longer, at a temperature of 97°—or that which is most comfortable to the feelings of the

patient, should be the next step; previously, however, relieving the bowels of their contents by a large dose of castor-oil. The bath should be repeated every four hours till the skin becomes perspirable; or where this is not available, a three-fold cloth wrung out in hot water should be applied to the chest and abdomen, removing it occasionally, as agreeable to the patient, and securing the part well from cold by a covering of flannel; or a bran poultice in like manner may be applied. In addition to these means, a saline mixture, with emetic tartar, to which some laudanum should be added, to allay irritability and coughing, may be given every two or three hours. The following is as good a form as can be desired:—half an ounce of liquor of acetate of ammonia, a quarter of a grain of emetic tartar, and six drops of laudanum, in a wine-glassful of water, or of emulsion of bitter almonds. The first dose may induce vomiting, but the second will be tolerated, or if not, the dose must be diminished. And lastly, though not the least in importance, to secure the integrity of the liver's function and the restoration of the suppressed secretions, a grain of calomel in combination with half a grain of opium, should be given both night and morning. The patient should be kept in bed, and in a moderately warm atmosphere, and allowed to drink freely of barley-water in which some prunes have been boiled.

296. When the skin becomes perspirable, expectoration will ensue—and the treatment may become more local in its character. Should the breathing continue oppressed, a dozen leeches should be applied in the hollow that exists between the neck and chest, and after their removal a good-sized blister should be applied to the chest. And as the breathing is relieved and amendment takes place, so may the mixture be taken less frequently; and lastly, the pills given only at night. The diet during the preceding period should be confined to barley-water, with milk, gruel, sago, arrowroot, and the like description of bland substances, and the same should be employed in all cases of acute inflammation and active fever; and the change very cautiously made to a more nourishing diet.

297. In a less severe form of affection, or milder attack, a less active treatment will be necessary. The application of a dozen or twenty leeches to the chest, and immediately they are removed, applying a large bran poultice to the chest, renewing it every three or four hours, in conjunction with the saline mixture, with antimony, will be often all that are necessary; following these means up, however, by a few doses of calomel, or the pills of calomel

and opium: strict attention to diet being at the same time observed, and a blister applied if necessary.

298. TREATMENT OF PLEURISY.—If the pleura be the seat of affection—marked by the pain in the chest and stitch in the side being more acute, the leeching, poultice, and in due season the blister, should be invariably adopted, as these have a more immediate and direct influence upon the affected part, in addition to the bleeding from the arm, mixture, pills and other means recommended in the preceding paragraph, to be pursued commensurately with the urgency of the symptoms. As in all cases of active inflammation of the lungs or pleura, there will but too commonly follow a certain amount of deposition or consolidation of the lungs in one case, or of effusion into the chest in the other, the calomel, from its deobstruent and peculiar stimulant qualities, is a remedy of much importance in the advanced stage of the affection, and should be given once a day or oftener, till the gums are affected. During convalescence it may be advantageously combined with a diuretic and gentle tonic, as an infusion of senega with potass; or decoction of bark and tincture of digitalis—the latter with the view of increasing the urinary secretion, the former of giving tone to the debilitated vessels of the affected part and restoring their healthy condition: added to which, should there continue the slightest sense of pain in the chest, indicative of some remaining inflammation, a constant, or an occasional blister will be an indispensable auxiliary.

299. TREATMENT OF COUGH.—A simple cough, attended with little or no fever, is often relieved by the application of a mustard-plaster to the chest. The mustard should be fresh mixed with hot water as for the table, but a little more fluid, and spread upon a napkin about the size of a cheese-plate, and then applied to the chest and windpipe, and kept on for ten or fifteen minutes, or as long as it can be conveniently borne. If necessary it may be repeated every evening; immersing the feet and legs at the same time in hot water, and taking also a tea-spoonful of a mixture, consisting of syrup of poppies, antimonial wine, and paregoric elixir, in the proportions of half an ounce of the first, with a quarter of an ounce of each of the others, every three or four hours, according to the severity of the cough; abstaining at the same time from a stimulating or a too nourishing diet. These means will soon remove the cough: though it is often advisable to follow them up for a few nights with a pill of calomel and aloes, a grain of each, in relief of the secondary derangements

of the liver and associated organs, which so constantly succeed to cold; and from the neglect of which, though persons often get well of the prominent affection of the chest, they yet remain for a length of time afterwards valetudinary.

300. TREATMENT OF SORE-THROAT.—Sore-throat is best relieved by the inhalation of steam from a basin of hot water, around which a towel is thrown enclosing the head, and the application externally of a mustard-plaster, or a liniment of equal parts of spirit of hartshorn and oil on flannel. Sucking a piece of saltpetre, before swallowing it, and gargling the throat with its solution in the mouth is another useful remedy. When accompanied by fever, after relieving the bowels by a pill or two of calomel and aloes, the saline mixture with antimony should be employed. In addition to these means, if the inflammation be considerable, the application of a dozen leeches to the throat, followed by a warm poultice, may be required, and subsequently, if necessary, a blister.

301. RELAXED UVULA.—Succeeding to a cold or from other cause, a congested and relaxed state of the uvula and throat sometimes takes place. This is best treated by anointing the part, by means of a camel's-hair pencil or a feather, with a mixture of chili vinegar and honey in equal proportions, three or four times or oftener in the day: this produces a copious flow of mucus from the vessels of the parts affected, empties them and restores their healthy excitement. Sucking a piece of alum occasionally is another useful remedy. Attention should at the same time be paid to the general health; exercise in the cold-air, conjoined with a more invigorating diet, and tonics, as a decoction of bark with sulphuric-acid, are remedies not unfrequently called for.

302. CATARRH—or the effusion of water or mucus from the nostrils, with the loss of the sense of smell and sneezing is often relieved by the frequent use of the smelling-bottle of ammoniacal salts; and when unaccompanied with fever, this with a pill of calomel and aloes and immersing the feet in hot water at bedtime will in general be all that is requisite. But when fever exists, or there is much pain in the forehead, inhaling the steam of hot water from a basin, placing a towel at the same time around it to exclude the air and include the head, is another excellent expedient, conjoined with the use of the pills of calomel and aloes, and the saline mixture with antimony every three or four hours.

303. INFLUENZA ; ITS CAUSE AND TREATMENT. — This affection is characterized by a sense of malaise, chill, lassitude, loss of appetite, attended in general with symptoms of catarrhal or bronchial affection, or sore-throat, and not unfrequently with muscular pains and headache, and more or less febrile commotion.

304. The cause is a damp, cold, and variable state of the atmosphere, impeding and deranging the functions of the skin and biliary organs. The same cause in a more aggravated degree, and associated with a low barometer and non-electrical state of the air, diminishing atmospheric pressure upon the surface of the body, impeding thereby the blood's return to the heart and weakening the system,—and further, allowing malaria to ascend from drains, sewers, or the like, and otherwise favouring the development and ascent of exhalations from the soil to elevations they would not otherwise attain,—and thus bringing many persons under their influence, and giving the disease an epidemic tendency. Such a combination of circumstances will necessarily give rise to a much more aggravated form of the affection—developing in certain conditions of the system, rheumatic fever, scarlatina, and typhus fever. The treatment of the mild and simplest form of this affection consists in taking a pill of calomel and aloes once or twice in the twenty-four hours for a few days—in restoration of the secretions of the liver and skin, and in support of capillary action ; or if there be catarrhal or other local affection of the air-passages or rheumatic pain, the pills before mentioned of calomel, antimony, and opium, every four hours will be necessary ; or the saline mixture with antimony and opium, and after the secretions by their agency have become free, and the febrile symptoms are removed, a tonic to establish the health may be required. Half a pint of decoction of bark with twenty drops of diluted sulphuric acid, taken in four doses during the day, or a grain of sulphate of quinine as often, will be the most suitable remedies, conjoined with a more nourishing diet, and in some cases a glass or two of wine in addition. The severer varieties of this affection, consisting in reality of typhoidal fever, will be treated of in the next chapter.

305. I have said nothing of the sequelæ of unsubdued inflammation of the lungs, bronchi, or pleura,—occasioning in the first instance consolidation of their substance, or abscess ; in the second of thickening and ulceration of the mucous membrane ; and in the last, of dropsy of the chest,—as these will seldom or never occur, if the treatment recommended is judiciously carried

into practice at a sufficiently early period of the invasion. As were I to carry out these subjects in all their details, I might with equal reason extend my work to the consideration of all the modifications of disease, which I have no intention of doing ; my object being to disseminate principles for the treatment of the primary affections, embodying them at the same time in their practical application to the more frequent forms of disease ; and which if attended to, the secondary will seldom or never occur. I shall not, therefore, after treating of asthma do more than glance at another but too frequent affection of the lungs, namely—phthisis, or consumption as it is generally called.

306. ASTHMA ; ITS CAUSES AND CHARACTER.—The affections of the lungs which I have hitherto mentioned, are all of a character implicating the vessels of their structural endowments more particularly, and little influencing the capillary vessels engaged in the absorption of oxygen and exhalation of carbonic acid or—those in which the lungs' function is performed. But the affection of which I am now about to treat—asthma, is of the latter kind. I believe asthma to consist principally in congestion of the functional capillaries of the lungs, arising from enervation, developing a spasmodic and irritable state of the air-cells, with symptoms of great oppression and difficulty of breathing. This congestive state, if continued, will necessarily be productive of inflammatory irritation of the more highly endowed structural capillaries of the organ, and hence sub-acute inflammation of the mucous membrane of the air-tubes will ensue, occasioning cough, expectoration, and so forth—the ordinary condition of the asthmatic subject.

307. The enervation of the lungs may be occasioned by cold, or certain other conditions of the air to which those predisposed to this disease are more particularly, or exclusively amenable. The attack in cases of the more particularly spasmodic kind, may be occasioned, and is not unfrequently so, by derangements of the stomach and digestive organs, between which and the lungs nervous connexion by means of the pneumo-gastric nerves is most intimate.

308. Valvular derangements, or defect of the heart's propelling or sucking power in relation to the lungs, would be productive also of congestion of these organs. And again, there are certain conditions of the blood in relation to its constituents—its abounding in certain elements which should have been excreted by the liver and kidneys, or the skin—which may, and I know do by

the irritation they excite—affect the pulmonary mucous-membrane to increased secretion; and in persons of full habit or prone to congestion of the lungs, is no unfrequent cause of the attack.

309. With these views of the disease, what are the indications of treatment? In the first case we have given, that of enervation, the restoration of excitement to the pulmonary capillaries, and the removal of its effects—congestion of the organ, are obviously the principal objects deserving attention; and with these intentions, if available, there is no remedy which offers such immediate prospect of benefit, as the inhalation of oxygen or nitrous oxide gas; a few quarts of either, there is good reason to suppose, would afford immediate relief. We have the evidence of Dr. Thornton, that these gases have been most successfully employed in these cases; and it accords with the nature of the affection that it should be so, as well as with the indications of Nature, as evinced by the craving for air which characterises the disorder.

310. Bleeding from the arm, to the extent of from eight to twenty ounces, in relief of the breathing and congestion—which exists, with a mustard-plaster to the whole of the chest, are remedies also strongly indicated*. I have often prescribed after the bleeding an active emetic (two grains of emetic tartar dissolved in an ounce of warm water) with great benefit. When this has completed its operation, it may be followed up with a pill of two grains of calomel in combination with one grain of opium; taking if necessary at the same time ten drops of spirit of camphor with a tea-spoonful of nitrous ether in a wine-glassful of water every hour or two till relief is obtained, and repeating the pill in half the quantity every three hours till sleep is procured, succeeded by a dose of castor-oil when this terminates.

311. When relief is obtained, and benefit procured by repose and a little nourishment, attention should be paid more particularly to the cause of the attack with especial attention to the liver and kidneys, and to the removal also of the consequences to which the attack may have given rise, namely, inflammatory irritation of the bronchi. In chronic cases, after due depletive measures have been resorted to in relief of congestion or inflammation—a blister may with great benefit be applied to the chest; and subsequently, an ounce and a half of the infusion of senega,

* A French lady with whom I am intimate,—a frequent subject of asthma, whenever attacked is invariably bled to the extent of twelve ounces or more with immediate relief of all the symptoms.

drops of tincture of cantharides, and as much solution of potass; or six drops of spirit of turpentine on a lump of sugar, two or three times a day, are often useful remedies; with a small pill of calomel and aloes every second night to maintain an active condition of the liver's function, and thereby prevent any redundant excretive matter accumulating in the blood and provoking a fresh attack—to which those who are regardless of what they eat and drink, or do not take sufficient exercise in the open air are more particularly liable.

312. PULMONARY CONSUMPTION.—This, I must observe, is a disease specific in character, dependent upon some general cause of derangement of the nutritive and healthy condition of the system. A disease, connected with some depraved or altered condition of the blood, in relation to its elements derived from without—as food, air, or beverage, or of defect in their assimilation; or in the purificative and secretive, or in the nutritive processes of the system—whereby there ensues a deposition from the blood of small granular albuminous bodies in the substance of the lungs; though not in the lungs exclusively, the same granular bodies or tubercles, as they are called, being not unfrequently deposited in the peritoneum and bowels also, and often conjointly so with the lungs. Scrofula is a disease of a similar character, affecting more particularly the absorbent glands, and occasioning a deposition in their substance, with enlargement and subsequent inflammation and abscess in those parts. These tubercles often exist in the lungs without occasioning any very sensible inconvenience; but the lungs so affected, under the influence of cold, become more amenable to inflammation; and under a low and insidious form of it these tubercles increase in size, and then, compressing and occupying the space of the air-tubes, become a permanent source of irritation to these tubes, and of extended inflammation: hence cough, expectoration, febrile commotion, &c., ensue. The tubercles increasing in size, and the parts surrounding them being involved in one common inflammation, they coalesce, and either in distinct clusters or severally soften, and become the seat of abscess; the contents of which communicating with the air-tubes, are now in part expectorated; a portion being also absorbed into the blood, and thus contaminating the vital stream— hectic fever, diarrhoea, and numerous secondary derangements follow; from the exhaustion of which, and the destruction of the organization, death necessarily soon closes the scene.

313. I have detailed thus much, with a view of showing that there can be no specific remedy for this disease—which, like scrofula, is an affection of the general system, and that all treatment must bear reference to the stage of affection. In the early stages it must be sought in the causes which gave rise to the tubercles: attention must not be directed alone to the relief of the cough and the symptoms of inflammatory irritation, but to the condition, so to speak, of the blood, or the depravation that may exist, of whatever kind, of the assimilative and nutritive processes, and of the general health and strength of the system. Strict attention to diet, air, exercise, warmth, clothing, and the like expedients of renovation, are evidently the remedies. And seeing that these bodies (the existence of which may be determined by auscultation and percussion of the chest—that is to say, tapping the outside and noticing the sound imparted of vacuity or consolidation, and of the air's murmur within) are soluble in an alkali, as Dr. Campbell proved by experiment; an alkali may very probably be taken with advantage, as he has recommended. And an occasional vapour-bath or rather the lamp-bath may be employed to secure a more active state of the functions of the skin, and prevent at the same time the development of inflammation. Sponging the chest every morning with salt water, and the daily use of the flesh-brush, are also useful expedients, and it is now a well-authenticated fact, that cod-liver oil has often proved itself to be a most valuable auxiliary*.

314. Cough, irritation, and fever, when these are present, must be treated upon the principles previously pointed out in such cases: and an issue or seton or perpetual blister on the chest, I am of opinion, may be sometimes very advantageously conjoined. As however much the practice, of the once celebrated St. John Long, was derided—it is no less a fact—that the plan he pursued of making a large ulcerated surface on the chest, and keeping this freely discharging for many weeks, often proved to be a successful remedy when all other means had failed. In the more advanced stage, when abscess is formed, liberating its

* A young lady, the subject it was said of consumption, having been sent to an hydropathic establishment, the lamp-bath for half an hour, followed by the wet sheet was prescribed for her use daily; from which she experienced such sensible relief, that unknown to her professional adviser, she was induced to take two baths every day, and so great was the benefit that in less than six months she had not only got rid of all her ailment, but had become quite strong and stout.

contents by an opening through the chest—wherever this can be accomplished, as has been recently suggested, and I believe practised, cannot, I think, be too strongly recommended—as death is more frequently occasioned by the absorption of the pus, or putrescent matter of the abscess, and the consequences it gives rise to, than from the destruction of the organization—which the powers of the system are, under other circumstances, we know, often capable of repairing.

315. HORSE-EXERCISE.—I shall conclude these observations, with the following quotation on the benefit to be derived from horse-exercise. These mind are the words of the justly celebrated Dr. Sydenham, written nearly 150 years ago—and therefore lost sight of, but not the less valuable as Sydenham was a truthful and a highly talented physician.

“Nor is this kind of exercise more beneficial to hypochondriacal people than to those who are in a consumption—whereof some of my relatives have been cured by riding long journeys by my advice, for I knew that I could not cure them by medicine or by any other method.” At first he advises the patient to take as short a journey as may be agreeable to his weak state, but to persist and increase the distance daily, till he be able, without regard, he says, to meat and drink or the weather, to proceed like a traveller and ride twenty or thirty miles a day. And Sydenham farther says: “Nor is this remedy proper only in small indispositions, accompanied with cough and leanness, but also in consumptions that are almost deplorable—when looseness accompanies the night sweats, which are wont to be the precursors of death. In short, however deadly soever a consumption is, yet, I sincerely assert—that the Jesuits’ bark is not more effectual in ague, than the exercise above mentioned is in curing a consumption, if the sick be careful and the sheets of the bed be well aired, and the journeys are long enough.” I shall make no comment upon what Sydenham has said, further, than observing—if capable of doing so much good under the very unpromising circumstances mentioned—how very important must horse-exercise be, and long journeys, in the treatment of the earlier stages of this disease—in which cases we may therefore with great propriety recommend it.

CHAPTER XIII.

FEVER IN ALL ITS FORMS—INFLAMMATORY AND TYPHOIDAL: CONSTITUTING BILIOUS-FEVER, AGUE OR INTERMITTENT-FEVER, SCARLATINA, RHEUMATIC-FEVER, ERYSIPELAS, CONGESTIVE-FEVER, SMALL-POX, MEASLES, &c.

316. THE ESSENTIAL CHARACTERISTICS OF FEVER.—I have already explained what constitutes fever in its most simple form, as occasioned by cold. I shall now speak of its varieties as occasioned by other causes. Fever may be defined to be a state of system under more or less general preternatural capillary excitement,—the condition, virtually, of *irritation*; in contradistinction to inflammation—which is the same in kind, but local in character, and augmented in degree by concentration: and hence, when the latter is considerable, is attended with a greater or less amount of heat and general excitement of the system, or, in other words, of irritative excitement or symptomatic fever.

317. FEVER DIVISIBLE INTO TWO ORDERS, INFLAMMATORY AND TYPHOIDAL.—Fever in itself can scarcely be regarded as a disease at any time, but as a curative effort of the system in relief of some oppression or perturbing cause of healthy manifestation. This is strikingly exemplified in the illustration given of the influence of cold in the development of fever; and it will be found equally true in all other cases—a few only excepted. The causes of fever in general, being the influence of some depressing agency upon the system—in relief of which the reaction of fever is the curative intention. The exceptions adverted to, are those which give rise to the directly inflammatory types of fever. These, it will soon appear, are few in number; but as they do exist, and as fevers of the same character are frequently secondarily developed; fever may be very conveniently divided into two orders—the Synochal or Inflammatory, and the Typhoidal or Depressing.

318. INFLAMMATORY FEVERS.—The *direct* causes of inflammatory fever are, as I have already said, but few, and confined, perhaps, to the excitement of spirituous beverage, or of some acrid poison in the blood, or other agent of directly irritating and exciting influence on the circulating system. But, the *indirect* causes of this form of fever are numerous: cold, as I have already explained, in its effects upon the perspiratory surface, is the most frequent one—acting upon a system favourable to this form of

prolonged excitement; that is, on persons for the most part who were previously in health, and especially those plethorically disposed, or whose blood abounds in combustible particles: hence the excitement is maintained, and the fever is continuous, as long as this condition exists. Another frequent cause of this indirect form of inflammatory fever, is biliary engorgement and derangement—the blood abounding in hydro-carbonaceous combustible elements, of which it should have been divested by the liver. The exciting and developing cause of fever in these cases, however, is very generally exposure to cold, or the immoderate use of some stimulating beverage.

319. TYPHOIDAL FEVERS.—On the other hand, whenever the blood is impoverished, or contaminated with malaria or other sedative agent, the type of fever is of the typhoidal or depressing order, and is characterized by certain periods of exacerbation and remission, and partakes therefore, in all such cases, of an intermittent or remittent character. The immediate cause of excitement in these cases is the congestion in the veins—which being progressively accumulative to the amount necessary to the development of fever, whenever the congestion is removed, by the arterial excitement which eventually ensues, the excitement of fever ceases. But it necessarily recurs afresh with the congestion, as in the first instance, if the cause which gave rise to it be not in the interim removed, or its effects obviated:—that is, so long as the system retains sufficient power, or, in other words, the capillary vessels possess the susceptibility necessary to impression; but which sooner or later become exhausted by this untoward action, and the complications of disease which ensue. Hence it is, from the debility that succeeds to the continuance of ague or intermitting fever, that the quotidian succeeds to the tertian, and the remittent to the quotidian form; and also, that the typhoidal so frequently succeeds to the synochal order of fevers.

320. INFLAMMATION SUPERADDED TO FEVER.—Superadded, however, to this idiopathic fever, in proportion to the severity of the cause, susceptibility of structure, or condition of parts, and the state of the patient with respect to fulness of vessels and condition of the blood at the time, will topical engorgement and inflammation be concomitant; which congestion or inflammation will in general, for reasons we have already given, be seated in those parts of the system the most remote from the heart's influence,—which being, as I have before pointed out, in the

stomach and bowels more particularly, and in the head, explains how both Clutterbuck and Broussais were led, by their post-mortem inquiries, to the mistake of assigning to these organs the exclusive seat of fever. In like manner, in the case of the parturient female, when the subject of this or other febrile cause—the womb, or its investing membrane—the peritoneum so often becomes the subject of inflammation; and hence the inflammation of these parts in puerperal fever, and the fact that the treatment required in these cases of inflammation, must bear relation to the cause—and form of fever that attends it.

321. **MALARIOUS FEVER.**—Reverting to malaria, we have analogical illustration of this cause of excitement in the operation of other sedative agents upon the system. Opium may be mentioned, small doses of which produce primarily a certain degree of excitement; and the same effect follows a less degree of cold than is productive of fever, as in the cold bath; whereas a large dose of opium induces an opposite effect, it being followed, if the dose be poisonous, by overwhelming cerebral congestion, which is exactly what takes place in the severer attacks of cholera and congestive fever from malaria; the cause in these cases being so virulent in character, that excitement becomes wholly suppressed, or, in other words, the blood is poisoned, and the arterial capillaries so paralysed in consequence that they are rendered insusceptible to influence—to the development of the reaction of fever, or at best but very inconsiderably so. The same explanation holds equally good in the continued exposure to the severer degrees of cold, by which the respiratory function is arrested, when coma or apoplectic stupor is induced, and sleep with death, is finally occasioned.

322. **HEMORRHAGIC REACTION, OR FEVER FROM EXCESS OF BLOOD-LETTING.**—There is another cause of fever, however, which has been treated of by Dr. Marshall Hall, well meriting attention, as forcibly illustrating the operation of sedative agents, and debilitating causes in general, in the production of excitement. This is the reaction or excitement following hæmorrhage, or excessive blood-letting. The loss of an undue quantity of blood is productive of general torpor or debility in the first instance, and this is followed by excitement, and is succeeded by exhaustion or collapse;—the same progression of symptoms exactly which takes place or succeeds to the other debilitating causes of fever, and which may be thus explained. From the loss of blood sustained, the quantity returned to the heart is not suffi-

cient on the contraction of the left ventricle, to distend the aorta, little is therefore carried to the brain; and from the same cause, (imperfect distension of the aorta,) little would at the same time be carried through the coronary vessels to the heart itself: hence the organic structure of both heart and brain not being duly excited, torpor of their functions, and debility or syncope, ensue. This is the primary effect, and is necessarily followed, as previously explained, by venous congestion in the remote parts, and the latter by excitement; as a consequence of the diminished quantity of blood circulating in the lungs increasing their absorptive power of oxygen, and the increased combustion that follows, provided the system retains power sufficient to maintain the reaction, or, in other words, the quality of the blood is such as admits of it; or the capillaries retain their susceptibility to impression; but which necessarily becomes exhausted by preternaturally increased action: hence follows collapse, in like manner as mortification—or the death of the part, succeeds to unsubdued inflammation.

323. The same views are equally well supported by the operation of the opposite class of agents upon the system; heat in moderation producing excitement; excess of heat, debility; and extreme heat, as by burning or scalding, mortification of the part, and death; wine or alcohol, also, in reference to quantity, producing exhilaration, atony, and death. All this supplies a mass of evidence which appears to me so irresistibly conclusive of the justness of the views of fever which I have enunciated, and the explanation afforded of its phenomena, as to convert what would otherwise appear mere hypothesis into a satisfactory theory of febrile affections of the system in all their varieties.

324. GENERAL INDICATIONS IN THE TREATMENT OF FEVER.—In thus viewing fever, what are the indications of cure? Assuredly not exclusively, in any case, the subduing of excitement, or the symptoms of inflammation, should symptoms of the latter kind even have become more particularly manifest; as the former, (febrile excitement,) I have rendered pretty evident, is only an effect of direct curative tendency; and the latter (inflammation) is also developed by the same agency, and with the same views, but under less favourable circumstances. Notwithstanding this, such is the mode of treatment recommended by some of the most talented writers on the subject; which with the too prevailing doctrines of Broussais, and some others, (founded upon the post-mortem examination of such cases of fever,) directing us to look

upon fever as in all cases symptomatic of inflammation, have done much harm, and call for decided refutation !

325. No ! febrile excitement is only an *effect*, and in the majority of cases—the indirect and typhoidal, which are doubtless the more frequent descriptions of fever—an effect of a morbid or ill condition of the blood. It is not only an effect indeed, but a curative one, which, however proper it may be to moderate or keep within due bounds, it is clear, should never be the chief aim of the practitioner to subdue. Our chief efforts should in this, as in all other cases of disease, be directed rather to the *cause*—remote and immediate, or the condition of the system, which gave rise to it ; and as this, in inflammatory fever, may depend upon, or be associated with, repletion of vessels, or the over-stimulating quality of the blood ; or the reverse of these conditions in the typhoidal forms of fever—the treatment must be varied accordingly. In the first case of inflammatory fever, in reference to both cause and effect, blood-letting is of direct curative application ; and in conjunction with means of the same depletory and sedative tendency, as have already been named when treating on the subject of fever from cold—experience proves, is the most successful practice. But however useful blood-letting may be in the foregoing condition, it is a remedy of very secondary indication in the treatment of the typhoidal forms of fever ; though doubtless a remedy capable of fulfilling certain very important indications of curative tendency in the treatment of these also, if judiciously employed. The chief indications of treatment in this form of fever, I repeat, in common with all others—but in this in a more especial degree bear reference rather to the causes remote and immediate giving rise to it, than those of moderating excitement.

326. MODIFYING CAUSES OF FEVER.—Before proceeding farther, another observation is required, viz., that the type of fever and the grades of malignancy are modified to a considerable extent, not only by the constitutional state of the individual at the time of attack, but by the nature of the exciting cause. The primary or remote cause, in the case of malarious inhalation, is often not of sufficient concentration to the development of fever, without the aid of the latter—a predisposing or exciting cause. Hence it is that some persons escape the attack of fever—intermittent or the like, till some time after removal from the source of the malarious emanation, when some accessory agency or exciting cause—as exposure to cold or other debilitating agency

—developes its action and the attack of fever. And thus too are fevers often compound in their character, and require in consequence a modified treatment.

327. CAUSES OF TYPHOIDAL FEVERS.—It will be remembered that I defined malaria to be the gaseous production of organized substances, both animal and vegetable, in a state of decomposition. As a cause of fever, I would not, however, limit the application of the word to the gases resulting from the direct decomposition of such substances, there being other exhalations and deteriorations of the atmosphere which produce similar effects;—for instance, a number of persons inhaling a confined atmosphere, and particularly such an one as must be respired by the inhabitants of filthy, damp, unventilated cellars, or in the hold or lower decks of a ship; independently of the exhalations which arise from the decomposition of sapulent wood and other organic substances on ship-board. That these, particularly the first-mentioned, are not unfrequent causes of fever, is unquestionable. In illustration of this may be mentioned the fact recorded of Mr. Howell's party, thrust into the black-hole of Calcutta, the survivors of which were, it is said, immediately attacked with typhus fever, and carbuncles, as in plague. From the like condition of atmosphere taking place about the persons of the sick, in dirty unventilated apartments, is it that contagious emanations become elicited in such situations. Hence, likewise, as the cause of the severer species of typhus, we may infer, the conjoint operation of the greatest combination of the requisites to that end, or the remote cause in the highest degree of concentration. Thus it is, that the miserable, half-starved, and too commonly depraved inhabitants of filthy, damp, unventilated cellars, or the like description of cabins in Ireland, are the most frequent subjects of these attacks; and that all the grades between this form and intermittent fever—the mildest species of this order of fevers—are but modifications resulting from the more or less favourable combination of causes of fever, and states of the system conducive to its development.

328. ESPECIAL INDICATIONS OF TREATMENT IN FEVER.—If the views I have taken of fever be correct, the principal indications of treatment obviously bear reference more particularly to the cause or causes which gave rise to it. In that arising from cold, I have already detailed the line of practice that should be pursued. In the fever originating in exsanguination from hæmorrhage or the like, or inanition, or impoverishment of the blood,

the stage of excitement should be moderated or kept within due limits by tepid ablution of the skin, or when the case admits of it, the cold affusion*; and for internal administration, water saturated with carbonic-acid-gas, saline mixture, cool enemata, and the like gentle means; and milk or a farinaceo-gelatinous, or other light nutriment, should be afforded—suitable be it remembered, both in quality and quantity to the weakened state of the digestive and assimilative functions. At the same time it must be borne in mind duly to support or sustain capillary action to the point of health, as nearly as it is possible in this weakened state of the system, by wine or other cordial given in the smallest quantity that will fulfil the purpose, whenever the circulation is below par; whereby the recurrence of congestion, and its consequence fever, will be prevented.

329. CAUTION TO BE OBSERVED IN THE ADMINISTRATION OF OPIUM IN FEVER.—It is in such cases as above described that opium has been so generally advised; and a most useful remedy it is when judiciously employed. Its operation on the system, it will however be remembered, is threefold. In small and repeated doses, or in a moderately large one, it is stimulant in the first instance; this is succeeded by quietness and sleep, and these not unfrequently by exhaustion equivalent to the previous excitement. In having recourse to this remedy, we must therefore bear in mind the indications of the period or stage of fever at the time being, so that the patient may have the full advantage of the restorative agency of balmy sleep, as well as that of the stimulating operation of the opium at the proper periods; anticipating also and providing for its succeeding effects and stage of exhaustion by the administration of suitable cordials; or congestion and fever may ensue. The powers of the system must therefore in this way, and in every particular, be carefully husbanded; and every cause of excitement and expenditure of power, by rising from the bed, too much light, reading, talking, and even thinking, be cautiously avoided; great attention must withal be

* Dr. Wilkinson observes, that whenever the pulse exceeds 120, it may be generally concluded that its frequency is the result of constitutional debility, the reduced energy of the heart compensating for power by more frequent feeble pulsations. "In cases where the skin is hot and dry, or the pulse exceeds 120, the tongue parched, how grateful to the feelings is the cold affusion! The heat of the body is rapidly diminished, the irritating dryness of the skin is removed, and the pulse reduced to that standard which allows of a quiet slumber and gentle perspiration."

observed to secure the patient fresh air, with immunity at the same time from cold.

330. INDICATIONS OF TREATMENT OF BILIOUS FEVER FROM HEAT OR COLD.—Should the cause of fever be the suppression of the cutaneous function, and the retention in the blood of the perspirable elements,—the effects of cold upon the system; the indications of treatment are, as I have before pointed out, the restoration of the perspiratory function, which is in general to be accomplished by moderating the attending excitement. Or, should the same agency operate upon the system predisposed to fever—by the blood's abounding in excess of carbon or the elements of the biliary secretion—the effects of continued torpor of the liver's function, brought on by cold or other debilitating agency upon the powers of the circulation; or as an effect of heat and defective oxygenation of the blood, as in a hot climate or season; giving rise in either case to bilious fever; the purification of the blood—by the excitement of the excretive functions in general, and of the liver in particular, is the chief indication of practice; moderating, at the same time, the febrile excitement that exists. Hence calomel is of all remedies the most useful, conjoined with antimony and purgatives in fulfilment of the secondary indications. And as this cause of fever may be based upon, or exist with, a plethoric condition of vessels or inflammatory habit—favouring thereby the synochal order of fever in a more exalted degree, the fever may run high in such cases, or inflammation become developed: and as the liver and bowels are more particularly the seat of engorgement, (and hence the præcordial oppression experienced,) so are they proportionably liable to inflammation in such cases—and in all, to derangement of function. Hence cholera-morbus, liver-inflammation, and dysentery—the diseases of hot climates and seasons; as well as diarrhoea and gastro-enteritis in this country—where aërial transitions are more considerable, and the skin's function in consequence so much more liable to be implicated also. These several affections require, in addition to the before-mentioned remedies, the free use of blood-letting, the warm bath, blisters, and other appliances, as will be hereafter more particularly noticed.

331. CONGESTIVE AND REMITTENT TYPES OF FEVER.—The same cause of fever coming into operation conjointly with malaria, may, as I have elsewhere observed, so depress the functions of life, that the reaction or excitement of the capillaries cannot, or otherwise will but very partially, take place: hence sporadic

cases of congestive cholera occur both in this and tropical countries, from a milder cause than usually gives rise to that affection. And hence, likewise, from the conjoint but mitigated influence of one or other of these causes, arise the bilious remittent, and compounds of this description of fever in hot climates and seasons, and the congestive and typhoidal fevers of this country: to the treatment of which we shall presently direct our attention.

332. TREATMENT OF INTERMITTENT OR OTHER MALARIOUS FEVER.—Again reverting to malaria as a cause of fever, of which intermittent fever or ague is the most simple form and type of the order; the same indications of treatment, of which the blood's purification would appear to be the chief, should be kept in view; though perhaps in this case not very readily to be accomplished. Experience has proved to us, that malaria having taken possession of the blood, and given rise to intermittent fever, adheres to it with a degree of pertinacity that will not readily yield to the ordinary means of accomplishing this, or allow us wholly to depend upon them. We may therefore conclude, that none of the secretive organs have any direct power of eliminating and divesting the blood of this aerial poison, in common with some other poisonous agents of this class. Hence we find fever and hydrophobia occurring often many weeks after the blood's impregnation with the virus, or, if I may be allowed the expression, after the seeds of the disease have been sown. I have reason, however, to think, that this aerial poison might be eliminated by the cutaneous surface—seeing that Nature appears, by the copious perspiration which so generally succeeds the attack of intermittent fever, to point out to us this as the remedy: and I would therefore, on a favourable opportunity occurring, strongly advise this suggestion being carried into effect, and that the stage of perspiration which succeeds the paroxysm of fever be maintained for a couple of days, or longer period, by antimonials, wine- whey, and other expedients of like character.

333. INFLUENCE OF BARK AND QUININE IN THE TREATMENT OF FEVER.—In the case of malaria, although it may not be in our power to divest the blood of its presence by the excitement of the secretive organs, the effects of the poison on the system in inducing congestion of the viscera and torpifying and arresting the liver and secretive functions, it is in our power to obviate or remove by such means: and by the agency of another remedy, we may supersede or annul its more general action upon the system; and this I believe to be the effect of the cinchona bark,

or quinine its active constituent in such cases. The operation of this remedy may therefore be to combine with and neutralize this poison, or to impart qualities to the blood incompatible with its baneful operation; or it may be that of a stimulant to the capillary vessels, more permanent perhaps than any other known to us—and hence its acknowledged qualities as a tonic, thus preventing the congestion of the veins which would ensue from the debilitating influence of malaria, and its consequence, capillary excitement. Whatever be its mode of action however, general experience at all events testifies, that quinine or bark administered in a certain quantity supersedes the effects of malaria upon the system, and prevents the development or recurrence of intermittent fever, as well as many other varieties of this type of fevers. This it does, I would say, without reference to its mode of administration, so much as to the quantity admitted into the system. The point to be aimed at is, the blood's saturation with it to a certain amount; and this I have noticed in many cases to be marked by the following characteristic symptoms of its operation,—a sense of fulness, or perhaps rather of tightness, in the head; singing noise in the ears; deafness, and obtundity of intellect; effects which I have very generally seen to follow the administration of twenty grains, in doses of a grain or two every hour during the period of the fever's intermission, or an equivalent quantity of the bark in powder; provided the stomach was in a fit state for its reception, and there was no congestion of its vessels to interfere with the absorption of the remedy. When such a congestive condition exists, Nature very generally with her usual providence rejects it, or it produces oppression of the organ, and should not be continued till the congestion has been removed. The fever seldom recurs after the symptoms enumerated indicative of the blood's impregnation with it, have become manifest; though it should be continued for some time afterwards, to maintain its influence. In ordinary cases of ague, three grains of the sulphate of quinine may be given in a wine-glassful of water every two hours, after the operation of a smart dose of calomel and jalap. Such, at least, is my experience, which, be it observed, has been considerable in the treatment of fevers of this description; having held medical charge of the renowned garrison of Seringapatam for a period of four years,—where fevers of this order, from the simple intermittent, to the exalted affection of typhus icteroides of authors—or yellow fever were endemical throughout the year; and where having suffered

much from visitations of the kind, I have often had personal experience of its operation and benefit.

334. OBSERVATIONS ON SCARLATINA, ACUTE RHEUMATISM, INFLUENZA, AND ERYSIPELAS.—From experience and observation made since my return to England, I am warranted in saying, that fevers from similar causes—malarious influence, variously modified by temperature, season, and a variety of circumstances, and assuming a variety of forms,—as acute rheumatism, influenza, scarlatina, and erysipelas,—and often too of epidemic prevalence, are of much more frequent occurrence than the profession in general are aware of. A subject to which I would invite their particular attention, as calling for the use of this remedy—bark, or quinine—which of late years in the treatment of these varieties of fever, it has not been the fashion much to employ. To this circumstance, I am of opinion, is the frequent fatality of such affections mainly to be attributed; as I know of no remedy which can fill the place of this, in the treatment of such cases of low fever, which it may be well to remark, are more particularly characterized by periods of intermission, exacerbation, or remission*.

335. SMALL-POX, MEASLES AND ERUPTIVE FEVERS IN GENERAL.—The small-pox and all the different descriptions of eruptive fevers, are dependent upon—the ordinary causes of fever—that is the blood's vitiation or impregnation with matters of some kind inimical to its healthy constitution:—matters, which should have been expelled the system by one or more of the excretive organs; or as foreign or poisonous matters—malaria or the like received in the system from without—or of materials originating in the imperfect assimilation or concoction of the food—or its being of an unwholesome character, or the beverage being so—and thus vitiating the blood. In this way are these several eruptive fevers induced, by one or other or a combination of these causes—though acting in the case of small-pox, scarlatina and fevers of the kind which usually occur but once in life, upon a system predisposed to the influence of the contagion or exciting cause whatever it may be,—by the presence in the blood of some constituent foreign to its nature, though perhaps harmless in its ordinary character—with which it now combines, and modifies the result. And thus instead of, as in the case of the

* A few of such cases I published in the 'Lancet' of the 15th July, 1843, and which I have thought proper in the following pages to append in illustration.

ordinary causes of fever, its passing off by sweat from the cutaneous surface or by urine—it develops inflammation of one or other of the structural tissues of the skin—according to its own specific character, and thus occasions the inflammation of surface and rash of scarlatina or measles, or the vesicles of the chicken, and the pustules of small-pox.

Thus viewing these several diseases, the treatment is clearly evacuant and anti-inflammatory in the first instance—exciting one and all of the excretive organs, by a combination of calomel and antimony with salines—and thus moderating the stage of excitement and limiting the tendency to eruption or keeping it within due bounds. And further, if the inflammatory symptoms run high, not neglecting the timely use of the lancet—employing it as it should be in any other case of inflammatory fever—which in character it assuredly is in the early condition;—though subsequently, from the exhaustion which so generally succeeds to irritation and continued excitement, or the absorption of the pus in small-pox—it very generally lapses into the opposite condition of typhoidal or remittent fever,—requiring in this case a treatment in accordance—namely, by quinine, opium, wine and support. And again, reverting to what I have said in a former paragraph, and pointed out with reference to other cases of disease—one and all of these affections, may be based upon or associated with a malarious and depressing cause, and it is incumbent upon us therefore in all cases of fever to look ahead, and not carry our evacuating class of remedies too far—and immediately they appear to cease benefiting the patient—to commence and feel our way with the opposite class of remedies—as in the case of malarious fever with dysentery before noticed, or adopt a middle course as the exigencies of the case may appear to require.

336. CONVULSIONS AND APOPLEXY PRECEDING THE ATTACK OF FEVER.—It will be obvious that the fevers of malaria may be, as in those forms which originate in the blood's surcharge with carbon or other excretive element, based upon or connected with fulness of system—or a condition favourable in other respects to the development of the synochal forms of fever; and thus may the attack be ushered in, or be preceded by, great congestive oppression, apoplexy, or convulsions in the cold stage; and the excitement of fever which succeeds this, may give rise to inflammation in some organ or structure, in which predisposition exists or susceptibility of structure renders more particularly

amenable to its influence; and as the viscera of the abdominal cavity and the brain, from the peculiarities in respect to the blood's circulation, are more particularly subject to congestion, so are they—the stomach, bowels, spleen, and head, subject also to inflammation. Hence the frequent affection of these organs in simple intermittent fever, and all the varieties of this order; as well as the imperfect intermissions and complications which so frequently ensue—in consequence of the inflammation which takes place, maintaining a continued local excitement, in many of the species of this—the typhoidal order and remitting type of fever.

337. THE CAUSE OF THE COMPLICATIONS AND PERPLEXITY ATTENDING THE SEVERER FORMS OF FEVER.—In this compound affection of inflammation—based upon a disease of direct debility, indicating, it would appear, two opposite modes of treatment, and requiring a very nice and discriminating practice—originates the diversity of opinion which exists among the profession, and the indefinite line of practice laid down by most writers for the treatment of such affections; but which I hope the explanation afforded will tend to remove, as I believe that it manifests that the *general* treatment should bear reference to the cause and condition of the general system, and the *particular* treatment should be directed to the local affection. Thus may bleeding and bark, calomel and cordials, be remedies not incompatible with each other—each having its due share and respective weight throughout the treatment.

In illustration of the utility of quinine in the cases enumerated, I here insert the following cases.

338. "ACUTE RHEUMATISM.—On the Saturday preceding the Tuesday on which the election took place, I visited a hairdresser, ætat. 56. I found him in bed, to which he had been confined for nearly a month with acute rheumatism, which had attacked him on the day succeeding to one that he had spent in the amusement of fishing. One of the knees had been first attacked with swelling and pain, which was accompanied with much fever; the disease then migrated into the other knee, and attacked also one of the wrists. The swelling and pain were now confined to one of his wrists. He had been bled, purged, and abundantly sweated, and was now profusely perspiring, and much attenuated. I immediately ordered him to take two grains of quinine every four hours without intermission. This he took, with the effect, that the next day he was better, and on the Tuesday was so

much improved as to be capable of attending the poll and giving his vote as an elector. He continued the quinine after this twice a day, and took an occasional pill of calomel and aloes for the period of about a month, and was restored by these means to perfect health.

339. "Another man I accidentally met limping about, by the aid of a stick, with a swollen knee. He was a butcher by trade, and told me that he had been for some time thus afflicted and incapable of work. Fever had accompanied the swelling of the knee in the primary attack. He had been twice in the hospital, on one occasion for ten, and on the other for six weeks, during which time he had been salivated, leeches, blistered, used hot-baths, and had adopted many other remedies, but with only temporary benefit. I directed him to take three grains of quinine three times a day, and to use a liniment composed of one drachm of sulphuric acid and fifteen drachms of olive-oil to the knee night and morning, rubbing it well in for half an hour at each time. A fortnight after using these remedies, he was so much benefited that he was not only capable of resuming his occupation, but declared that he was able to walk ten miles at a stretch."

340. "I was requested to visit J. C., aged sixty; he had been attacked two months before with acute rheumatism. The local affection had during that time migrated from ankles to knees, and thence into his shoulders and wrists: he had during the greater part of this time been under professional treatment, and had used the thermal-baths. He was, when I saw him, hobbling about with a stick, with his ankles swollen and shoulders painful; he had suffered by diarrhoea two days before, and appeared cold and languid. I directed him to improve his diet, and take a pill containing two grains of quinine and a third of a grain of opium, three times a day. Three days after, when I next visited him, I found him in bed perspiring freely. He had taken eight of the pills. His wrists were swollen and extremely painful, his pulse 120 and firm, his bowels confined, and his breathing a little oppressed. He was now bled to twenty ounces, and a grain of calomel with three grains of antimonial powder, in a pill, were directed to be taken every three hours, with a drachm of sulphate of magnesia in solution. The next day I found he had been freely purged, and had passed a better night. The same pills were directed to be continued every four hours, and a fourth part of the following mixture was substituted for the sulphate of

magnesia, to be taken between the doses of the pills:—Solution of acetate of ammonia, three ounces; vinegar of colchicum, two drachms; tincture of opium, twenty minims; water, five ounces. On the next day I found that he had passed an excellent night; the pain had quite left his wrists; his pulse 84, soft; his breathing free; in short, that he was convalescent. I now ordered him the pills of quinine, as in the first instance, with one of the pills of calomel and antimony every night; and by these means he soon completely recovered his strength.

341. "SCARLATINA.—I was requested by a lady, twenty miles distant, to visit her family as soon as possible, as a son and daughter were dangerously ill with scarlet fever. I reached the place of her abode the same evening, when I found the son had died two hours before. The daughter, a delicate girl, aged seventeen, was delirious in bed, had great difficulty of deglutition, a small irritable pulse of 120, and an excited skin. Leeches were then being applied to the temples, and powders of calomel and antimony being administered every two hours. The leeches I directed to be immediately removed, and sent for the medical attendant; on his arrival, after consulting with him, as he declined any responsibility in the measures I thought it necessary to pursue, the case was thrown altogether into my hands. The patient's skin was now sponged with tepid water, and the throat gargled, or rather mopped, occasionally with a large hair pencil, dipped in a mixture of strong chilly vinegar and honey, which produced a copious muculent salivation. Soon after this a grain of quinine, in solution, was administered, with a table-spoonful of port wine; and the same was repeated every two hours throughout the night, and two or three spoonfuls of sago and wine were given her between each dose. On the following morning the throat was much better, the fever had declined, and she expressed herself as feeling in every respect better. The remedies were continued, and in the evening all danger was at an end. After this she continued the quinine in doses of three or four grains during the day, and was well by the end of the week.

342. "Another son and also a servant of the same family were attacked the day after my arrival at the house—the disease being of epidemic prevalence in the town and for many miles around. They were both treated by an emetic in the first instance, followed up by a dose of calomel and jalap; and after the operation of this by a tea-spoonful of bark-powder, with two table-spoonfuls of port wine, every two hours, with immediate

convalescence ; and this treatment becoming now general in the town, was very successful.

343: "ERYSIPELAS.—An infant fourteen months old was attacked with erysipelas on the face, which extended down the neck to the chest, and down the arms to the finger-ends, the hands becoming cedematous. Calomel, antimony, and purgatives were freely administered for more than a week without permanent benefit ; on the contrary, the disease was extending itself, and the child had become comatose. Under these circumstances half a grain of quinine was given every two hours, and a blister applied to the thigh. The amendment was almost immediate, and the child was two days after convalescent."

344. As I advocate in all cases attending strictly to Nature's indications, and as erysipelas in the severer forms often develops a blistered surface—that is, blisters are formed on the skin—I am of opinion, that in all cases in which relief is not obtained by perspiration,—which should be early induced, if possible, by the conjoint influence of calomel, antimony, opium, and the tepid bath, after due evacuation of the bowels, and blood-letting if there be much excitement,—a blister should be applied, not immediately on the part inflamed, but in its vicinity ; the whole phenomena of the disease clearly evincing the presence of an acrid irritant in the blood, that has a tendency to pass off by the skin.

In support of these views, and in evidence of the success which has attended their adoption, I beg leave to be permitted to subjoin the following communication—I had the honour to receive from the writer—a gentleman quite unknown to me—whose testimony therefore is the more valuable :—

"Upper Marlborough, Maryland, U. S. North America,
Feb. 28, 1848.

"MY DEAR SIR,

"I presume you are the author of the several communications on the subject of fever, dysentery, cholera, &c., which appeared in the *Lancet*, of London, in 1843. I have preserved the *Lancets* which contain your 'Medical gems,' for *such* I consider them, and they are *now before me*.

"I am actuated by no other motive than to 'render unto Cæsar the things which are Cæsar's.'

"I am convinced from my own observation that your Pathology is *perfectly correct*. I live in a malarial region of country, and I have seen with my own eyes, the phenomena of Cholera,

Intermittent, Remittent, and Congestive Fevers, and I believe them to be *all* links of the same chain of diseases, having the same origin and amenable to the same treatment. I will also add, Dysentery, Scarlatina, Acute Rheumatism and Erysipelas. And I am satisfied from experience, that the '*sine qua non*' in the treatment, *is*, to use Sulphate of Quinine in *large* and *repeated doses*, regardless of all inflammation. Your cases of Scarlatina, Rheumatism, and Erysipelas, *first taught me the treatment*, and I take this opportunity to return you my grateful thanks, and send you this hasty letter, as a spontaneous offering from an humble member of the medical profession, who at least can appreciate *your practice*, and can rejoice at having adopted it.

"With sentiments of the highest regard and esteem,

"I am your obedient Servant,

"Dr. Searle, of London."

"JOHN H. BOYLE."

CONCLUDING REMARKS.

Having at length completed what I have to say—on the causes, phenomena, and treatment of all the primary disorders and diseases to which humanity is liable—and I may venture to add without fear of contradiction, in so saying—clearly demonstrated that—as life and health are dependent upon the normal or pure state of the blood,—so in like manner, is disease of every description dependent upon, or connected with—the blood's vitiated state or abnormal condition, in relation either to quality or quantity. And again that, the primary operation of this abnormal condition of the blood is—so to derange the powers which circulate the blood (acting in general as a sedative or depressing agent) as to occasion—the passive condition of congestion of the veins, or otherwise—the active excited condition of the capillary arteries or inflammation;—or the intermediate and less active condition—of subacute inflammation or irritation when limited in the extent of its operation, or when not so limited to a part—but general throughout the system—that of fever. And that one or the other of these—which run into each other by insensible gradations, constitutes the disease virtually—that is its

essence or pathological condition, in whatever organ or part it may be located.

And if this be true, which it unquestionably is—as the description therein given of every disease amply testifies—it of necessity follows—that the treatment of every disease is brought within the compass of a few general principles—definite in kind and readily to be understood: and in so doing, the subject has been divested of all that chaotic mass of bewilderment and obscurity in which till now it has been invested,—rendering it on the contrary as clear as the light of the noonday's sun—that to divest the blood of its impurities, restore it to its normal condition of perfection—and remove the effect or consequences of its abnormal state, or that of congestion, irritation, or inflammation—whichever may have been developed by its agency—is the sum and substance of all treatment:—whatever difference of opinion there may be, as regards the measures to be pursued in carrying them into effect—whether I am right with respect to blood-letting and those means I have thought proper, as the fruit of my lengthened experience, to recommend—or not so.—Whether in this, I may be considered right or wrong, this I know—that I both see and hear, and frequently, of persons falling a sacrifice to disease—whom, I am as certain, as of my existence, might have been rescued from such premature death—had but the proscribed lancet, or a few leeches been timely had recourse to in their treatment.

Finally:—*having now completed a work—united in all its parts—each dependent on and arising out of the other, in their natural order of affinities—constituting one whole and complete body of the Science of Medicine—solid in its foundation, and perfect in its superstructure—I shall now, by way of Supplement, add, some general rules founded upon the principles enunciated for the preservation of health, and renovation of the system when impaired.*

SUPPLEMENT.

Having embodied a complete system, in outline, of the Principles and Practice of Medicine, and of the Philosophy of Life and Health, I shall now add, by way of Supplement, some General Rules, founded upon these principles, for the preservation of health, restoration from disease, and for the renovation of the system when impaired.

Attention to the Dictates of Nature.—The first of the means to be pursued with the view of preserving health, may, from its importance, be justly designated the cardinal point, and, although so conspicuously important, is the very simple rule, of attending at all times to the dictates of Nature, or the admonitions of the various senses with which we have been gifted for this purpose: for the chief or essential intention of the endowments of hearing, seeing, smelling, taste, and feeling, is, that the body may be directed by their agency, supported in its requirements, and preserved, through their instrumentality, from the numerous dangers with which it is on all sides surrounded:—that sight and hearing, directed by the intuition of Nature—or common sense, should be the means of our protection from impending danger, whether it come from behind or from before us, as from the serpent or the thorn which may beset our path, or the advance of the waves, or the mad bull in our rear;—that the sense of smell, presiding over the inlet to our air-passages and lungs, should direct us to avoid air contaminated with any deleterious gas or offensive effluvia of whatever description, as injurious to the system. And again, the sense of taste—situated in the mouth, the other great inlet into the system—acts as a sentinel at the gate, guarding the passage into the stomach against everything in the shape of food and beverage which is ungrateful to the palate, and therefore unwholesome to the body. And next the sense of feeling and of touch—the endowments of the skin—are similar in purpose, and intended to preserve us from the extremes of heat and cold, and from injuries by wound or contusion. To which may be added, as of like import to the system, the sense of hunger and thirst, the admonitions of which are equally deserving our attention. And lastly, the sense of fatigue, and its opposite condition—excitation of the system,

which induce us to repose when required, or to make the exertions necessary for our nutrition and support, and thus fulfil the laws of Nature and the conditions of our existence. These are endowments of the system, one and all of them, common to the whole animal creation, and ordained therefore evidently for our admonition and guidance; speaking intelligibly to all, and directing us to eat when we are hungry, and drink when thirsty, and to shun whatever is disagreeable to our physical sensibilities, as injurious to our organization and nature.

Having made these preliminary observations, the subject of which merits at all times our utmost respect—being the laws of Nature and of common sense—I shall now proceed to give a few concise rules, or rather exhibit the principles which should be observed with respect to diet, air, exercise, and the other elements of our existence: on which subjects, I would recommend the reader to see what has already been said in the 3rd chapter.

The Air.—The purity and temperature of the air are the most important of its qualities, and accordingly are the points of view in which we shall chiefly regard it. The dictates of Nature should invariably be attended to: it should be remembered that the air is pre-eminently the source of life, and that a portion of every mouthful we inspire will assuredly find its way into the blood. Avoid, therefore, most scrupulously, all offensive smells, and every trace of the air's pollution; such, for instance, as an atmosphere contaminated by the breathing and exhalations from the persons of others, or by the products of combustion, of fermentation or decomposition. Crowded assemblies, the vicinity of burial-grounds, drains, dung-heaps, cellars, the banks of rivers, the abodes of the multitude, and low miry localities, should therefore be as much as possible avoided. The following extract from Mr. Ritchie's pamphlet on the ventilation of factories, sets forth in a very clear manner the importance of pure air:—"If the various convolutions of the air-cells of the lungs were spread out, they would present a surface thirty times as extensive as the surface of the body; over this extensive surface, through exceedingly minute vessels, the entire blood of the body passes every three minutes; we respire every twenty-four hours a quantity of air that would fill upwards of seventy-eight hogsheads, and the blood passes more than five hundred times in the course of a day through the lungs, exposed to this enormous quantity of air respired. Thus in proportion as impurities exist, the air we breathe becomes a slow or more rapid poison."

Clothing and Temperature.—And next with respect to temperature. True to the dictates of Nature and common sense is the rule—that an agreeable feeling of warmth should at all times be maintained, or, I should perhaps have rather said, a feeling of cold should be avoided, as there can be no question that the most healthy condition is that in which we radiate or give out heat most freely from the system, without experiencing at the same time any sensation of absolute cold; inasmuch as this condition is one of more active production of heat in the system:—the demand induced by radiation calling forth the necessity for, and occasioning, an increased production of heat, and with this, be it remembered, augmented vital development. It is not, therefore, the sense of warmth nor that of cold, but the happy medium between them, namely, a refreshing and grateful feeling of coolness, which should be aimed at. The temperature of our habitations, and the amount of our bed-covering and clothing should therefore be in accordance with this rule; making at all times a suitable provision against the emergencies of our variable climate; and adapting such provision to the constitutional powers and occupations of the individual. A delicate person may with propriety be clothed in flannel; but a strong and healthy one is much better without any such covering, at least next the skin. The habit of clothing the head during the night with a warm cap is a practice also highly objectionable, and absolutely injurious to persons subject to a flow of blood to the head, headache, colds in the head, &c. There is good sense in the adage, “Keep the head cool and the feet warm.” In proportion as the body is too warmly clothed, and the pure air excluded from the surface, is less warmth produced in the body, and the body becomes chilled. The Scotch highlander with his naked legs does not feel colder, surrounded with the snow-clad mountains, than he whose legs are clothed. Our faces without inconvenience are left bare in the coldest weather.

Flannel and Cold Ablution of the Skin.—Returning to the subject of wearing flannel constantly next the skin, I must observe that I have derived great benefit from transferring it to the exterior of a cotton shirt. The practice of wearing flannel next the skin, has a tendency to relax the surface and weaken the healthy function of the skin, and, by association, to weaken the functions of the lungs and all the internal organs, to which, in their lining membrane, the skin affords a continuous coating. At the time of throwing off the flannel, however, let it be observed, I adopted

cold-sponging the surface on getting out of bed in the morning, a practice which cannot be too strongly recommended. It involves no slopping, as I practise it. After throwing off the shirt on getting out of bed, a towel should be wrung out in a basin of cold water, and the head, chest, and subsequently the whole of the body and the extremities, should be well rubbed down with it, reimmersing the towel occasionally in the water; and this should be followed by a good general rubbing of the body with a coarse dry towel, and subsequently with hand-rubbing of the surface. The very delicate may throw a handful of salt into the water, and on commencing the practice, confine the ablution to the chest and abdomen, and progressively extend it to the head, back, and limbs; and after it return to bed for ten minutes, or until comfortably warm again. Those in the habit of wearing flannel, but who do not absolutely require it, I should advise to throw it aside, or transfer it to the exterior of the shirt, as a protection from any sudden transition of temperature.

Advice to those of Costive Habit —The surface of the body it is intended by nature should be at all times a radiating one, whereby the heat of the interior organs is constantly flowing towards the skin: by which means a more healthy and active condition of the stomach and bowels is maintained, and thus is the appetite, as everybody knows, increased by exposure to cold air; and more than this, I can say from experience, the bowels kept free. Before I threw aside my flannel, and adopted the practice of cold ablution in the morning, my bowels required the constant excitement of medicine; but since then, I have not required this assistance. Those who are habitually costive, will do well to follow my example: or if this fails, then try the use of the sitz-bath, described in page 137. On returning to bed at night, the body should be again exposed to the air for a few minutes, rubbing it well during the period with a pair of horse-hair gloves, and afterwards with the hands. In the winter season, the very delicate may confine the ablutions to the chest; or a good general rubbing with the gloves may be substituted, with an occasional warm bath. In those of robust health, the daily use of the shower or plunge bath is to be preferred to ablution of the surface; but to the delicate and nervous, the shock which is involved in their use may be objectionable; and unless there is reactive power sufficient in the system to develop a comfortable glow or sensation of warmth after the use of either, it should in no case be employed. The great object to be attained by the bath is the

establishment of an active and healthy condition of the skin's function, and by consequence, protection from transitions of temperature, and other deranging causes. In so doing, tone and a healthy activity are moreover imparted to the functions of the lungs, and to the stomach and bowels; for their lining mucous membrane is one continued surface with that of the skin—in short, a prolongation of the same, denuded of its outer covering. Now, as everybody must at one time or other, on putting his hand into cold water, have experienced the sense of cold which pervades the skin, and is felt over the body and in the back in particular, he will have no difficulty in conceiving, that by imparting activity and tone to the skin, he may in like manner, by continuity and consent of parts, impart the same to the internal organs also. The skin is a secreting and exhaling surface of vast extent, enveloping all the body and lining all the viscera, fulfilling, in concert with the lungs, the function of respiration; and the stomach and bowels, in addition to that of digestion and absorption, fulfil the same function, I believe also, for reasons given in a former chapter.

Great Importance of an Active Condition of the Skin's Function.

—The influence and importance of an active and healthy condition of the skin is, therefore, of first-rate consideration. Assiduous attention to this cannot be too forcibly enjoined, the skin being, if not the mainspring, assuredly one of the most influential of the regulating powers, of the system. The celebrated Boerhaave observes of the perspiratory function; that the quantity of its secretion exceeds that of all the other excretions put together; and that its normal active condition demonstrates the most perfect health, of which it is also the principal means of preserving—as it thus purifies the blood. In support of this, the recent very singular results and important experiments of Messrs. Becquerel and Breschet, of Paris, may be adduced. A rabbit being plastered all over with a material impenetrable to the air, and thus arresting the skin's function, its temperature was reduced from one hundred degrees to eighty-nine before the composition was dry; an hour after, it had cooled down to seventy-six degrees. On another rabbit, prepared with more care, by the time the plaster was dry, the temperature of the animal was so much reduced, that it fell to sixty-two degrees; and an hour after this, the animal died. These facts forcibly demonstrate the vast importance of maintaining an active and healthy condition of the skin's function, and explain the success which has unquestionably

attended the practice of the hydropathist in exciting activity and imparting tone to the skin's function, of restoring health and adding strength to the system, in a great number of cases.

Cautions to be observed after Exposure to Cold.—The secretion eliminated by the skin, in India, is in general acid, and pungently so, as is evinced not only by the taste, but by the fact of its so often discharging the colour of the dress of the ladies, as may be observed about their arms. And this, without doubt, is the ordinary effect of a healthy condition or active state of the skin's function; and if so, may well explain how gout, rheumatism, and some other affections, are so often developed by changes in the weather restraining the cutaneous function and this acid excretion from the system. Exposure to a damp or cold state of the atmosphere, or to partial currents of air, is very liable to check, torpify, or arrest this function, and should therefore be guardedly avoided, as well as all unnecessary exposure to cold. And it must be constantly borne in mind, that after any such exposure, warmth must be gradually and cautiously imparted, or inflammation or fever may become developed, as we see exemplified in the chilblains which succeed to cold in the extremities, or cough and catarrhal affections, which are of like inflammatory character, and are often induced in this way—by entering too warm a room on coming out of the external cold air: the cutaneous surface, it will be remembered, extending along the air-passages into the lungs.

Rules of Diet.—This subject bears reference to the solid constituents of the blood, and to the offices more particularly of the stomach and assimilative organs united in its formation. The fundamental rule to be observed with respect to diet, is moderation in quantity, and simplicity in kind. And assuming that Nature (who has thrown over us the mantle of her protection in so many other contingencies of our nature, and in the endowments of the senses of smell, taste, and appetite, with which we have been gifted, and which are alone sufficient for the guidance of the rest of the animal creation,) has not withheld from us the light of her countenance in so essential an element of our well-being and existence as this, which has for its object the nutrition of the system—I take it for granted, and in so doing am borne out by general observation, that, attention being paid to the simple injunctions given, guided by common sense, (and not mistaking the impulse of bad habits for Nature's promptings,) all things are good as food that appetite

and inclination may incite us to desire—excepting such as the observation and experience of the individual prove to be otherwise. Most persons have attained, in some way, a particular idiosyncrasy in this respect; making true the adage, that “what is one man’s food is another man’s poison;” to which I would add another trite but rational observation, namely, that “every man should be his own physician at forty;” which, if not strictly true in all cases, is so in this; for that man must be sadly wanting in common sense, or a fool indeed, who, when he has discovered that lobster-salad, pork, fruit, feasting, or excess of any kind, disagrees with him, does not take advantage of his experience and abstain from the same in future; and I may add, relieve his stomach and bowels from the presence of any such offender, when found to disorder him, by taking some simple remedy, as a tumbler of hot water with a tea-spoonful of common salt in it, as an emetic, or a dose of rhubarb, magnesia, or the like, as an aperient; and if this fails to restore him, the more efficient remedy of a pill of calomel and aloes which will so.

Importance of attending to the Dictates of Nature.—I assume, therefore, that Nature, who, in creation, has made man supreme, and the inhabitant of every part of the earth’s surface, in her bounty and provident arrangement has not restricted him in the choice of his food, and that all things are good which, when taken in moderation, agree with him. Before concluding this subject, I would again observe, that Nature’s indications in all things merit our especial observance. The true physician has been justly styled the “handmaid of Nature;” and so considering him, I can truly aver, that I have often been led, in severe and doubtful cases of disease, in opposition not unfrequently to my own preconceived opinion on the subject, to the right line of treatment, by pursuing her indications alone—as manifested by the desires and appetite of the patient; which on all occasions I feel it my duty, therefore, to respect and cautiously to indulge.

Moderation Defined.—Of moderation I shall briefly observe, that it does not imply, as some would define its meaning, leaving the table with an appetite unsatisfied: no, moderation consists in the happy medium between oppression from satiety and its opposite condition of a feeling of insufficiency; the latter involving, as it would do, loss of weight and debility.

Time of taking Meals.—From the foregoing and other obvious reasons, it is impossible to define, with any semblance of accuracy, the proper hours for taking meals, as these must in all

cases bear reference to the age and constitution of each individual, as well as the circumstances in which he is placed. But the principles which should direct every one, may be clearly defined and readily understood. And first with respect to time: the physiological indications clearly point out, that the hour for taking the principal meal should be in the evening, inasmuch as the energy of the stomach and vital functions may be said to be in antagonism with that of mental and muscular exercise; hence the most favourable condition for sleep is that of a full or well-employed stomach, by which the electro-nervous or actuating power of the system is fully engaged: hence the drowsiness which is so generally experienced after taking a full meal. And again, for the same reason, the most favourable condition for digestion is that of repose, or abeyance of mental and muscular action, that all power may be thus employed in digestion. And a further good arising from this arrangement of the dinner hour, is, that we become thus redolent, or rich in juices well concocted during the night, for active circulation and support under the duties of the following day. The habit of individuals, and custom, I know, may argue otherwise; but these are fallacious guides. If we are true to Nature, we shall adopt her precepts, and make the evening the time of our principal meal, following the example of the brute creation, which invariably repose after a meal.

Objections to a Late Dinner answered.—A person habituated to an early dinner, may often be heard to say that he could not delay his dinner till a late hour. Certainly not, seeing that he dined early on the preceding day, and has necessarily expended all his store of assimilated material. Another observes, that he could not sleep after a late meal: and he is right also, if only a few hours previously he has taken a hearty meal, and this, a second one is taken without appetite or necessity.

Character of the Dinner.—The rule is obviously in favour of a late dinner, which should be ample in proportion to the wear and expenditure of the day, and solid, or otherwise in accordance therewith. And although variety as to kind is not prohibited, no incongruity of admixture should be admitted of. Common sense would direct us at one meal to confine ourselves to a good joint of meat, with vegetables and bread in proportion, or a pudding; instead of partaking of a dozen dishes, and these too commonly dissimilar in kind, as we see so thoughtlessly and frequently practised.

Tea and After-meals.—The evening should be spent without labour or study, in agreeable amusement; which may be followed up, two or three hours after dinner, with a cup of tea or coffee, as an agreeable diluent and exhilarant, and a biscuit or crust of bread-and-butter before going to bed; or if the hour be late before retiring, a sandwich, or something more substantial, may be necessary to secure the stomach's occupation, and engage any free or unemployed power which might otherwise excite the brain to thought, and prevent sleep.

Character of Breakfast.—The breakfast should be taken soon after rising in the morning, and be of a character corresponding with the duties to be performed in the day, remembering that mental employ is adverse to much stomach occupation. This may be succeeded by a lunch four or five hours afterwards, and which in like manner should correspond with the feelings and necessities of the individual, consisting of a biscuit with fruit in one case, and a few sandwiches in another: the quantity, however, should in no case interfere with the appetite and necessities for the dinner, the social meal and hour of enjoyment.

Requirements of the Delicate.—To these observations I must however add, that the frequency of meals cannot in all cases be limited to the periods named, or to the description of them which I have given. A delicate person, or one advanced in years, proportionate to the feebleness of the general system and corresponding powers of the digestive organs, requires a meal more frequently, less in quantity, and of a lighter description, or of more delicate nature. Such persons may require something every three or four hours, or even oftener: the rule in all cases should be regularity as far as practicable, with a feeling of appetite, or of emptiness should that not be experienced.

Want of Appetite.—This, I may briefly observe, too commonly implies congestion of the liver and bowels—when no remedy will be found so efficient in restoring appetite as the loss of a few ounces of blood, if it is not absolutely prohibited by the state of the individual, and other means have failed.

Salted Meat, and indeed salt provisions of all kinds, as well as fat pork, are unquestionably of more difficult digestion than most other kinds of food: they require, therefore, the more active power of the stomach of the labouring classes and the vigorous to assimilate them. Fat is of all substances the most

nutritive, but requires abundance of air and exercise for its assimilation and digestion*.

Beverage.—With respect to beverage, from which are derived the fluid constituents of the blood, I must first observe, in addition to what I have already said on the subject in the 3rd chapter—that the natural, the most simple and wholesome fluid, water, is the only essential and proper beverage for man, as it is for the rest of the animal creation. It requires no decomposition, no digestion; in its simple state it enters immediately into combination with all substances, fat and oil excepted. Beer or wine, and all the other spirituous and exciting beverages in too common use among mankind, are perversions of our social habits and the Almighty's gifts, from the purposes to which they should be confined—namely, as occasional cordials and renovators of the system under enervation and exhaustion of power, or disease. Although good malt liquor may be allowed to the hard-working man, whose labour often exceeds his electrical productive power, his food being but too frequently of an imperfectly nourishing description, or difficult of digestion, neither beer nor wine (which latter without the nourishment of beer is more exclusively exciting) can be taken with impunity by those whose muscular powers are but little called into exercise, and who at the same time are abundantly fed. Yet many doubtless appear to do so for a length of time without suffering any very sensible inconvenience; but disease, be it remembered, is often protractive and accumulative also; the liver and kidneys, which are brought into too great requisition to excrete or separate all such injurious agents, the latter in particular, often becoming diseased, and is a very frequent cause of death without any pain or sensible indication of it during life, except perhaps, that lumbago is experienced occasionally; and in other cases sciatica, or gout—an affection of similar origin, is thus induced.

* Dr. Cheyne—a celebrated physician of his day—instituted a great number of experiments in relation to the nutritive qualities of the different articles of diet—and found that a person was better supported, and could live longer on suet pudding than any other substance. This, in an economical point of view, it is desirable should be more generally known, and it had been well had such knowledge been acted upon in the dieting of our troops in the Crimea. And blood, too, which in the slaughtering of cattle is allowed to run waste—it is important also to know, is little more, and nothing less, than fluid flesh—and is equally wholesome and nutritive.

Pure Water :—I would therefore repeat, is not only the natural but the best beverage that man can use. It may be taken at all times in moderation, according to the degree of thirst and the desires of the individual ; and in most cases at the ordinary temperature of the spring from which it is drawn ; or as toast-and-water (which should be made by immersing the toasted crust in cold water) to those who give it the preference. Soda-water and the like description of effervescing beverage (charged with carbonic-acid—a highly sedative and poisonous-gas)—now in too common use, should be regarded as medicinal agents, and not be taken without necessity ; the necessity consisting very generally in the abuse of spirituous beverages—of which it is in some respects the antidote.

Tea and Coffee.—The infusion of these grateful exhilarants in boiling water as ordinarily practised, in moderation there is no great objection to, provided they are not taken too hot or too frequently. They should in a general way be confined to the breakfast-table and to persons of an adult age. The young require no excitants of any kind ; milk to them is more suitable, abounding as it does in nourishment, which is a quality that neither tea nor coffee possesses. I have observed that tea or coffee in a general way should be confined to the breakfast-table, though a cup of one or the other may, without any great objection, be taken by most persons in the evening. I mean by this reservation to say, that I believe there are many who would sleep better, and enjoy much better health, were they not to do so. The exciting qualities of tea upon the nervous system are rendered very apparent by the sleepless nights induced to those unaccustomed to its use in the evening ; and coffee in most cases will produce the same effects. To persons, therefore, who are the subjects of any spasmodic or nervous affection, although sleeplessness may not be induced, they are nevertheless clearly prohibited. And to the dyspeptic—another large class of persons—the sugar, and hot water in which they are infused, render them equally objectionable ; whereas cold water—saturated as it is with atmospheric-air—possesses positively beneficial virtues in many such cases.

Exercise :—is of two kinds—mental and corporeal. The former bears reference more particularly to the function of the brain and nervous system, and the latter to that of the muscular. I shall now speak of physical exercise, or that of the muscular system. The condemnation of man was—that “in the sweat of

his face he should eat bread all the days of his life, for of the dust of the earth was he formed, and unto dust should he return :” his physical organization was therefore ordained, doubtless, to fulfil this decree of his Creator. A life of active exertion accordingly, if not indispensable in all cases to his existence, is certainly the most conducive to the perfect and most efficient performance of his organic functions, and consequently to the health and well-being of his nature ;—an amount of positive good, be it remembered, not limited to his corporeal functions—the whole man being united in all his parts, but extended to the manifestation of his mind also, which becomes invigorated in an equal degree, though confined necessarily in its operations, to the extent of its culture.

Exercise divided into Active and Passive.—With a view to a methodical consideration of the subject of Exercise, it is necessary to consider it in two points of view—in relation to its character and extent—whether *active* or *passive*. It may be said to be active when it is carried to the extent of walking two, three, or more miles, according to the age and constitution of the individual, at one time and with earnestness ; or the exercise of some other of the muscles to an equal degree ; or to the extent of producing a more or less perspirable condition of the skin. And passive, when it is confined to the usual loitering, or the ordinary exertions of everyday life.

Active Exercise, to all those who are abundantly fed—or I should rather say, this being the ordinary condition, whose diet borders on excess,—for reasons given in a former chapter, is, for the enjoyment of health, indispensable. And on the contrary, in the case of those who are scantily fed, exercise should be of a very passive description. For such as are moderately fed, the exercise, in like manner, should be proportionate in degree. Persons amply fed require in general exercise to be carried to the full extent of its inducing a perspirable condition of the skin, and this continued in a greater or less degree, or for a longer or shorter period, according to the amount and description of diet employed, and the constitution and state of health of the individual at the time being. It is obvious that, to maintain a vivid combustion, the fuel in the fire-grate must be proportionate to the quantity of air or oxygen accessible to it : an excess of fuel producing a smothered and smoky fire. And so, in like manner, must the food furnished to the animal machine bear a like proportion to the air inspired ; of which we have the means of thus

increasing the amount by exercise. And again, as with the fire in the grate, if excess of air be admitted to the fuel, as urged by the bellows, the fuel is soon burnt out, and the fire extinguished, the grate too being perhaps made red-hot, and more or less injured by the process; so, must exercise be limited to the amount of food and sustenance received into the system, and at no time be carried by its nature or force to the extent of inducing great exhaustion or injury of any kind to the animal machine.

Influence of Exercise, and the want of it.—Exercise of the muscular system increases the action of the heart and respiratory function: and, in consequence of the increased vigour of the circulation, the blood—the pabulum of life—is supplied more abundantly to the remotest parts of the system, and increased energy of function extended to all the organs. Hence, the cause of, and the evils arising from the want or deficiency of exercise, are (in contradistinction to the active joyous feeling of health) inertia, mental and corporeal—characterized by the symptoms more particularly called nervous and dyspeptic—deficiency of appetite, constipated bowels, languid circulation, short or oppressed breathing, muscular lassitude, chilliness, and mental torpor, or disquietude.

Out-door Exercise enjoined.—With this explanation of the principles upon which exercise operates, and the symptoms more particularly denoting the want of it, the adaptation of exercise to the constitution and circumstances of each individual may be well left to every man's own common sense and keeping. Whether the exercise be within doors or out of the house, is a consideration merely of temperature, bearing reference to invalids more particularly. Persons in health should not be deterred by the weather, unless it is very bad indeed, from taking that amount of exercise abroad which they find to be necessary. Habituation will soon make all changes of weather harmless to them, as we see exemplified in the labouring classes, who are exposed to its vicissitudes at all seasons. The invalid must of necessity be more cautious; and if a billiard-table is not available to him, exercise may be taken by traversing the room, and exercising the arms and legs in every possible way, by dancing, or by the chopping of wood, use of dumb-bells, or the like, or in expanding the chest and exercising the lungs by reciting aloud a poem or other composition, in conversation, or in singing:—and if no positive objection exists to it, with the windows open. Riding on horseback, or in a carriage, should bear reference to

the strength, and to the nature of the ailment, of the invalid, and to the capability of the patient's sustaining or being benefited by the excitement of the first, or otherwise. For example, for a person convalescing from an attack of acute inflammation of any kind, or disease of the heart, horse exercise, generally speaking, would be too exciting; but not so when recovering from an attack of gout, rheumatism, or the like. Long journeys on horseback too, is a remedy of unquestionable value, and so is pedestrian travel, in the treatment of the dyspeptic, the nervous, and the whole class of functional disorders (see the encomiums passed on the first by Sydenham in the last chapter). With respect to temperature, it may be briefly observed, that whenever the individual is not capable of the active exercise necessary to maintain a comfortable feeling of warmth in the external air, the exercise should be confined to the house; but in all other cases, unless some special reason to the contrary exists, or the weather or any other cause forbids, it should be invariably taken abroad in the open air; for change of air, like change of diet, is often of great benefit, and especially so to the invalid.

Time of taking Exercise; and other important Remarks.—I shall now make a few observations upon the time of taking exercise. We have all duties of the day of one kind or other to perform; these, accordingly, the objects of our existence, should be commenced upon immediately or soon after the breakfast meal, whilst the system has an abundant exchequer to draw upon—the accumulated fund of electro-nervous power and product of a night's repose, as well as the well-concocted juices of the last evening's dinner—to sustain exertion. Four or five hours' mental employ is as much as should be at any one time, and indeed in any one day, devoted to this purpose, or the mind, like the over-stretched bow, may either snap with the exertion, or lose its elasticity. But if necessitated by the circumstances of the individual to do more, it will be much better to continue the labour after a small interval of rest, than to defer it till a later period of the day. The duty of the day, whether mental or corporeal, should be completed before the dinner-time, bearing in mind to reserve for the special excitement of the stomach, an hour's devotion to abstinence from all employ before that meal. After the four or five hours' mental employ, the remainder of the day before dinner should be devoted to exercise, in walking or riding, or muscular exertion of some kind, under the guidance of the rules we have noticed. And when the dinner is completed—

which should not be too hastily effected—(every mouthful of food being well masticated, in order that a due proportion of air and saliva may be combined with it before it is swallowed,) the evening should be spent in agreeable society or amusement. A person whose day has been wholly devoted to mental occupation, after his dinner and an hour's quietude, may very properly engage the remainder of the evening in walking, dancing, billiards, or other not too active exercise. In like manner, the person whose day has been passed in muscular exertion, may more appropriately spend his evening in reading or mental employ; allowing the mind to rest half an hour or more before going to bed, or retiring whenever sleep is disposed to enfold the system in its soft embrace.

Mental Employ.—On this subject (a most important one to the health and well-being of every individual) I shall here very briefly observe, that to the successful cultivation of the mind, as well as to the soundness of its manifestations, a healthy state of the body is an essential requirement; and to maintain this, moderation in the mind's employ is as indispensable as muscular exercise and attention to diet. Study, I must add, (by which I mean close application of the mind,) requires perfect abstinence from the excitement of spirituous beverages, together with a full amount of sleep. Besides these precautions, an occasional holiday of some days' complete respite from all mental occupation, with change of air and exercise in the country, cannot very well be omitted. The cultivation of the mind will otherwise be at the expense of health—man's best possession—a superlative good, the exchange for which, no mental attainment, however great, can prove any compensation.—To these scanty remarks I have only to add the request, that the reader will attentively consider what was said on the subject of mental employ in the third chapter.

Sleep and Repose.—"Tired Nature's sweet restorer, balmy sleep!" An explanation of the phenomena of sleep, and how it is induced ("to die thus living, and thus dead to live") has been given at page 65; to which, in connexion with what I have now to say, I would first direct attention, adding with reference to the time of seeking repose and the amount of sleep required, that the dictates of Nature and common sense are the best counsellors. We see that all the rest of the animal creation are guided instinctively to seek repose when fatigued, and again to rise when refreshed by its influence; and man should do the

same whenever he feels, from the exhaustion of exercise of any kind, to require it, instead of following the too common practice of swallowing some excitant or other; although doubtless, as a general rule, the hours of darkness, as marked out to us by our provident Creator, should be those exclusively devoted to the full measure of the enjoyment of sleep; and for such period, whatever it may be, as its influence lasts, and until we awake refreshed. Upon an average eight hours for an adult person—the time required by a labouring man—will be a fair proportion. The labourer in general goes to bed at nine at night, and rises at five in the morning—when Nature for a great portion of the year is attired in her most lovely garments—and “the breezy call of incense-breathing morn” appears to invite man to its enjoyment. But the hour of retiring to bed in civil life, provided it be before midnight, experience proves to be of no very great importance, so that the eight hours, or the full period required, be devoted to the purpose. The quantity of sleep absolutely required, it is evident, bears reference to the degree of labour undergone by the individual, and the quantity of exercise taken during the day,—relatively, however, let it be understood, to the exercise of the mental, no less than the muscular energies of the system, and also to the age and constitution of the individual; the infant, with short intervals, being wholly thus engaged, and the delicate and infirm requiring a relatively larger proportion of sleep.

Sleeplessness, how to be remedied.—As the state of being awake, or alive to all the impressions of the mind and the senses, is one of vital activity, or electrical excitation of the brain—imparted by and derived from the accumulated fund of electro-nervous power, or exchequer of the system; and sleep is the contrary condition, or abeyance of sensorial and mental activity; how all-important must exercise of the muscular system, and expenditure thereby of electro-nervous power, be to the attainment of sleep! And again, as another mode of expending this power, and thus preventing an overflowing exchequer—swamping the sensorial organs, and exciting the brain to thought, and as a consequence preventing sleep—is the diverting it into a different channel, and engaging it in the stomach’s employ, by taking a meal, as I have elsewhere advised, before going to bed. Another expedient which may be resorted to, if a walk, a dance, or a game of billiards be not available, is reading aloud something of interest, but not of too exciting a character, for an hour

or two before going to bed, and thus drawing off into a different channel, and expending, a portion of the electrical stock. Another expedient, which in my own person I have often found successful after undergoing perturbation or too much mental employ, is that of having the hair combed for half an hour before going to bed, or rather, as I have found much more efficacious, getting a young person to pass the fingers through the hair and manipulate the head: this I have found very soothing, and especially so, if done with a cool and rather damp hand; for which purpose the hand, when it is not so, may be occasionally immersed in water, and partially wiped. A portion of the electricity of the system, I am disposed to believe, may be thus withdrawn by the hand of the operator, and hence the excitement of the mind is diminished, and a calm state induced. Or the scalp, insulated as it is by the hair from the air's influence, may by this operation be rendered conductive, and the same result ensue. Moreover, the electricity actuating the mental organ, and exciting the circulation of the part especially concerned, or more particularly engrossed in thought, is directed by the blandishment of the operation, and diverted into a new channel or different portion of the brain, to the relief of the over-excited part, and sleep succeeds—other conditions being favourable—that is to say, there being no overflowing exchequer, or surplus fund of exciting power.

Mesmerism.—In short, is not this the sum and substance of all that is done by the mesmerist, and does not the following afford a full explanation of the hypnotism or somnolency which his operations induce? First, the mind is diverted from more active occupation, and isolated in the passive engagement of attention to the manipulations of the operator; influenced at the same time by the means before adverted to—the fingers and body of the operator affecting the electrical condition of the individual operated upon; and lastly, (though not least in the amount of causes influencing the result,) the condition of the respiration during the period of the mesmeric manipulation; a proportionate quietude of the respiratory movements being an invariable concomitant of the body's quiescence and the mind's abstraction to the manipulations going on. Respiration, being in a great measure a voluntary act, it is obvious, must be so influenced. In like manner is somnolency induced by some simple idea, such as counting an indefinite number, or looking steadfastly at a single object; or mentally repeating a piece of poetry, and thus dimi-

nishing respiration, and diverting the mind into a new channel; and that one of negative influence only or of passive excitement.

Possibility of Mesmerism being occasionally useful.—Should the foregoing explanation of the mesmeric manipulation be considered tenable, it would afford some explanation of the mode in which benefit may have been derived (as it has been said to have been by a person of no less reputation than Dr. Elliotson,) by its operation in epilepsy, chorea, hysteria, and some other cases of spasmodic affection implicating the brain, by diverting and drawing off the exciting stimulus of these organic actions from the portion of the brain affected, and locating it for the period of the operation, and as long after as the imagination bears upon the subject, in another part of the organ—to the relief of the one affected; independent of the direct benefit which might reasonably be expected from the brain's condition of quietude during the somnolent period, and the transference also of excitement to the abdominal and vital organs, which attends the condition of sleep. But the jugglers' tricks of pretended clairvoyance and phreno-mesmerism, are too ridiculous to merit notice, further than by giving expression to the feelings of indignation and contempt which are naturally excited by such gross attempts at deception.

Sleeplessness, Anxiety of Mind, and Insanity, how to be averted.

—There are other causes of sleeplessness besides those already adverted to; and to these I shall now direct attention. The first I shall mention is one of too frequent occurrence at the present day, namely excess of mental employment, or perturbation of mind—whether arising from expectation and anxiety, excessive grief, love, or other cause of mental excitement. In all which cases, vast is the benefit and great is the comfort afforded by a pill of soft opium, of a grain, or a grain and a half, on going to bed. With some persons sleep follows immediately; but with others it does not take place till some hours afterwards; and such will do well to remember, if it be necessary to repeat the pill, to do so that number of hours before the time of going to bed. If the cause, however, has been of some duration, and the biliary organs in consequence have become deranged, combining the opium with double the quantity of calomel, will add much to its good effects. Many have been impelled by their feelings of wretchedness and anxiety to commit suicide, who never would have allowed the thought of such an act to take possession of their mind for one moment, had they but experi-

enced the consolation and comfort of a good night's rest, which might have thus been so easily obtained; and there are many others, who are now in the confinement of a lunatic establishment, from anxiety and the influence of causes of the same character, who never would have become insane, had this simple remedy for their grievances been timely resorted to. With some, the soothing influence of from ten to fifteen drops of laudanum taken once or twice in the day, will fulfil the purpose better than a single dose at night, when the cause of mental disturbance continues in operation. Under extreme bodily fatigue, also, the system may by the same remedy be supported.

Nightmare and Bad Dreams.—Other causes of sleeplessness consist in the flatulent distension, or over-loading of, or crudities in, the stomach and bowels—imparting, without sense of pain, by reflex nervous connexion, excitement to the brain. Bad dreams and nightmare are often thus induced. Or the excitement of the nervous system, and sleeplessness may be induced, by the retention of the heat of the body by excess of bed-covering, or keeping the head too warm. Another cause of sleeplessness is a dry and non-conducting condition of the skin, when, with a sense of heat, restlessness is experienced: this may occur from the use of wine or too exciting a diet, or from the blood abounding in elements which should have been excreted by the skin or liver, resulting from torpor or derangement of the functions of these secretive organs—when a warm bath, ablution with warm water on going to bed, or a pill of calomel and aloes, for a few nights, may be required. Having pointed out these several causes of sleeplessness, it is obvious that the removal of the cause is the one and only remedy; in reference to which I must refer the reader to the chapter to which each case respectively bears reference.

Wakefulness after a few hours' Sleep.—Another observation I may be permitted to add for the benefit of some persons, who fall asleep perhaps soon after they get into bed, but wake some two or three hours afterwards, and cannot sleep again. This is a condition which may in general be remedied by getting up and eating a good-sized crust of bread-and-butter, (provided none of the causes of ailment, to which I have previously adverted, exist,)—thus engaging the nervous power in digestion and the nutritive processes—and returning afterwards to a cool bed.

RESTORATION TO HEALTH, RENOVATION AND INVIGORATION OF
THE SYSTEM.

Renovation of the system can imply nothing more than restoration to its pristine condition of health. It is my intention, however, in this chapter to extend the subject to that of invigorating a weakly constitution. Debility of the constitutional powers, derangement of the function or structure of one or more of the organs, or depravity of the blood or derangement in its elementary constituents—one or other of these elements of disease, or all of them, must of necessity be the condition of the system, presupposed to exist, and requiring remedial measures, with the view either to its renovation or its invigoration. Under such circumstances, the first thing to be done is to effect a careful examination of each organ, both in its individual capacity and in its relative connexion.

Examination of the Organs.—Beginning with the stomach, as the central organ of the body—Is it affected with pain or uneasiness? Is the appetite indifferent or capricious—and is the stomach liable to flatulent distension? If either of these symptoms exist, and especially if it be conjoined with constipated bowels, torpor of the liver is most probably the immediate cause; and attention to this is the chief indication to be held in view. For the mode of treating this disorder, I must refer the reader to the previous chapter on that subject; attention in all cases being at the same time paid to air, exercise, diet, and the means already enumerated for preserving health. Should continued nausea or sickness of stomach exist, aggravated by taking food, or by pressure over the affected organ, a congestive or subacute inflammatory condition of it probably exists; requiring in this case bleeding—local or general, aided by mercurials, with the view of unloading the vessels of the stomach, which are connected with those of the liver, and increasing the secretion of bile and the circulation through that organ. Symptoms of an analogous description may, however, be dependent upon atony or debility of the organ, as a sequel of the undue excitement of spirituous beverages. In this case, if of short duration, bitters and ammonia are the remedies, and abstaining from the offending cause in future; but if of longer duration, congestion will have taken place, and the treatment must be the same as in the former case. If again the bowels, instead of being constipated,

are habitually relaxed, and this condition be not produced by the habitual indulgence in some improper article of food or beverage—a plethoric or congestive condition of the veins of the bowels is most probably the cause; consequent either upon there being more blood in the system than the heart is capable of freely circulating, or upon some impediment to its passage through the liver. In the first case blood-letting is required; and in the second, the exhibition of calomel, in relief of any such obstruction: for particulars refer to chapter on the subject.

The Bleeding of Piles and other spontaneous Evacuations generally curative efforts of the System.—The evacuations I have spoken of in the last case are evidently curative efforts of the system, and so are the formation and the bleeding of piles, which more frequently attend the opposite condition of constipation; and the latter, when habitual, is very generally based upon a plethoric or congested state of the liver, impeding its function; or if not, upon a hardened state of that organ, induced by the habitual use of wine and spirituous beverages. Obstruction of the liver is, however, a source of numerous derangements, and gives rise to a multitude of symptoms, the veins of the bowels, the neck of the bladder, and womb, being all in connexion with the liver, and associated likewise by nervous connexion, are not unfrequently united also in disease. From which causes in after-life, when the powers become enfeebled, and the constitution and habits of the individual altered—the male leading a less active life, and the female system not being relieved as it used to be after the manner of the sex—and blood in consequence accumulating in or being in excess of the requirements of the system—congestion in consequence takes place in the liver, and the several organs in connexion with it become engorged, when disease of the neck of the bladder, or prostate gland, or stricture takes place in the male; and in the female, congestion of the neck of the womb and leucorrhœal discharge ensues; or enlargement and disease of the womb or ovaries (appendages of the womb) take place. In other cases piles, followed by abscess and fistula; or enlargement of the liver or spleen, and dropsy, follow. Or, from the accumulation of fat, which is now often abundantly formed in relief of the system, the descent of the midriff and the expansion of the lungs are obstructed, and asthma succeeds—if apoplexy or palsy does not occur. Now the simple explanation afforded of the cause and true character of these various affections, conspicuously points out, that the treatment is the same

in character in all these cases, modified only by the nature of the organ affected and the stage of the affection: the inflammation of the part which very generally succeeds to the congestion, not unfrequently however produces effects which survive their original cause, as in the cases of enlargement of the prostate gland, fistula, disease of the womb &c. But the early treatment is alike in all these cases, and consists in general of bleeding, in relief of the system, followed up by local bleeding from the anus or the immediate vicinity of the part affected, conjoined with calomel, diuretics, and aperients, in excitement of the liver, kidneys and bowels; and a more abstinent diet, with early rising, air and exercise, and the frequent ablution with cold water of the part affected, or daily use of the sitz-bath.

Hæmorrhage from the Stomach, Womb, &c.—At an earlier period of life engorgement of the vessels of the liver, implicates not unfrequently those of the stomach also—and gives rise to vomiting of blood; in other cases the vessels of the lungs are engorged and expectoration of blood follows; or if of the womb—flooding takes place: all of which symptoms I look upon as curative efforts of the system, and to be treated therefore by bleeding and evacuants—rather than by tonics and astringents as so commonly attempted.

Importance of attending to apparently trifling Derangements of Health.—The kidneys next merit our attention. Is pain experienced in the loins? If it be, it behoves us carefully to examine the urine. What are its appearance, its specific gravity, and quantity voided in twenty-four hours? These are questions especially deserving attention, disease of the kidneys being a much more frequent affection than is generally supposed; and it may exist without pain for years, without the individual being at all alive to the fact, and to the danger of his condition. The subjects of Lumbago or Sciatica will do well to consider this, and remember that pain of the kind is much more frequently the concomitant of disorder of the kidneys—than rheumatic or muscular, as it is so frequently thought to be. Again, is the desire to evacuate the urine preternaturally frequent? and is its expulsion attended with sense of scalding or pain of any kind?—if so, it evinces an inflammatory condition of the mucous membrane of the bladder or urethra,—dependent in general or associated with engorgement of the liver: when a pill of calomel and aloes should be taken every night, and the anus and parts adjacent should be freely leeches, or better cupped.

Treatment of Pain, and the Premonitions of Disease in the Organs of the Chest and those of the Abdominal Cavity.—Should continued pain exist in any organ or part of the abdomen, especially if the pain be increased by pressure on the part, or on making a full inspiration, an inflammatory condition of the part so affected may be inferred, and bleeding, local or general, be indispensable to its relief, conjoined with evacuants and an abstinent diet. The same remark holds equally good with respect to the chest: should pain be experienced in any part of it, attended or not with cough, shortness, or difficulty of breathing, or sense of the girth of a ligature between the chest and abdomen, bleeding will very generally be required. Many too who cannot venture abroad in the winter season from cough and cold, which invariably follow such exposure, may thus by bleeding remove the congestive fulness of the lungs, and be relieved from the necessity of this confinement.

Premonitory Symptoms of Apoplexy, &c.—Lastly, with respect to the Head; should pain, with sense of fulness, and confined bowels, or drowsiness by day, giddiness, or deafness, or chronically inflamed or bloodshot eyes, be experienced; or cataract, impaired vision, defect of memory, or impaired articulation; these symptoms are all dependent on congestion of the blood-vessels of the brain, and are often the precursors of palsy or apoplexy. In all of these cases it is obvious that bleeding and evacuants are the proper remedies: but these will be required necessarily over and over again, unless the individual can be induced to practise more self-denial, take more exercise, and improve his general habits.

Objections to Blood-letting answered.—In professional practice it is the constant reply of the patient to our advice that he should lose blood in these cases—"No, I cannot lose blood, or I must be constantly repeating it!" "Certainly you will," I say, "provided you continue to eat and drink and take as little exercise as you lately have done; how can it be otherwise, if necessity now exists for bleeding, and you continue the practice which gave rise to the production of this surplus quantity of blood? The necessity in future has nothing to do with the bleeding, but with your continuing the cause of it." Another will reply, "I am already so weak, that I require blood being put into my veins rather than withdrawing any from me." And yet such a person, if thrown from a horse, would not hesitate a moment in allowing himself to be bled in anticipation of an evil which may

never arise; yet, with disease now in operation, he refuses to submit to it! because he feels weak, which necessarily must be the case from disorder of the functions and the want of the diurnal accession to the blood of new and well assimilated materials—which alone give strength at any time.

Loss of Life how commonly the result of neglect.—I mention these cases, which are of daily occurrence, merely to show how little common sense is exercised in these matters, and how profoundly ignorant the multitude are on subjects which above all others should afford them the greatest interest. Thus we hear daily of one person falling down dead in the street, and another paying the debt of nature after only a few days' illness. Who can be surprised at such occurrences, seeing that so little is known of these matters, and less done for their prevention? For disease, I maintain, with very few exceptions indeed, is accumulative in the system, and would seldom occur if people would attend to the premonitory stage and the deviations of health, of some kind or other, which invariably precede absolute sickness. But no, this most useful knowledge and precautionary practice, as long as the individual can stir a leg, or swallow food, is wholly neglected; and the consequence but too frequently is, that the sexton is called in soon after the doctor. Whereas with proper care and attention, I believe life might be preserved to a much more extended period than it now is, seeing how numerous are the conservative powers in operation in the system, and the available means we possess both to cure and to prevent disease.

Disease of the Heart.—I have yet said nothing concerning the Heart. If pain in its region exist, with oppression of the circulation, bleeding must necessarily be had recourse to; but more than this I shall here say nothing, as the numerous ailments both of function and structure to which it is liable, are, with very few exceptions, secondary in character or subordinate to some other disease, if they are not directly developed by nervous derangement or mental excitement, in the way I have pointed out in the chapter on this subject.

I have now completed a hasty and superficial glance at the more immediate and frequent affections of the principal organs, and the symptoms which characterize them; and would refer the reader for more particular information on each subject to the chapter in which such subject has been treated on.

The newly-formed Blood; the Pabulum of Life and Nutrition.—I shall now, in conclusion of this part of my subject, add such

remarks as I have to offer, upon the remaining very important subject of the Blood's condition and depravity, annexing some observations on nutrition in connexion with the subject. First, I maintain, that the elements of the blood (constituting the pabulum of life) or such as are essential to the building up and nutrition of the system, as well as those of combustion and vitalization, are those of diurnal accession—the *newly-formed blood*! I do not believe in the constant building-up and pulling-down system of Liebig and others; by which the human system is supposed to be in a perpetual state of mutation and renovation; and by which, it is said, changes essential to the blood's qualifications are effected. I believe in nothing so opposed to that simplicity and economy which reign throughout all Nature's operations. Fat (an inorganized substance—the product of nutrition surplus to the immediate necessities of the system—a deposition in the cellular structure, like honey in the comb,) is no doubt stored up one day, and is absorbed and again enters the circulation on another, whenever the requirements of the system exceed the immediate supply furnished by the stomach; and thus it is, that persons lose their weight and become thin by illness and starvation, and regain their weight so soon as these causes are removed. I do not deny that in *starvation*, after the expenditure of the fat, the tissues will be consumed: but this is an extreme case, an effort to maintain life when no other resource is available. But the fibrous structure and solid textures of the system remain, as in the case of the fibre of the oak, a permanent structure; and the brain of today, an organized fibrous structure, is in like manner the brain of tomorrow also; and thus is the individuality of the character maintained; else, the instability of a man's mind would be constant. In illustration of this, let us now trace the operation of Nature's simple laws in the process of nutrition, and in the development of the chick, from a few primary elements constituting the egg, which will leave no question as to the fact I wish to establish; namely, that the newly-formed blood is the true pabulum of life—a fact very important in the consequences I wish to found upon it, in relation both to the renovation of the system and to the cure of disease.

The Incubation of the Egg, and simple Constitution of the Blood.
—The chick, developed by the incubation of the egg, under the vivifying influence of the parent's temperature of body, is formed and fashioned in a few days out of the few elementary materials

of its blood, which becomes first formed out of the simple albumen or white of the egg, in combination with the air of the atmosphere which has access to its surface. The yolk which subsequently enters the system consists of albumen also, with some oil and sulphur; these add to the qualities of the blood, but fulfil the purposes I believe more particularly of combustion in the advanced stage of its development, when its temperature is much augmented and vitally increased. The animal in the short period of twenty days is perfect in all its parts, and, redolent of life and heat, it now quits its shell, and becomes an independent creature: thus fashioned and wholly constituted, out of a few simple elements which enter into the composition, or principally so, of albumen (which is composed of carbon in the proportion of 56 parts in 100, with 7 of hydrogen, 15 of nitrogen, and 22 of oxygen), in combination with, and otherwise changed by the influence of the air of the atmosphere—a compound of oxygen and nitrogen; which, under the influence of the heat of the parent's body, enters into combination with the albumen, and first converts it into blood, as the microscope clearly demonstrates; and after birth on inspiration is the source of its heat and vitality.

The Nitrogen of the Air an essential Element of the Blood and Animal Nutrition.—The independent creature, the newly-formed animal, now daily increases both in size and weight, feeding upon grain alone—oats or barley—the principal constituent of which is starch, which is composed of 45 per cent. of carbon, with 6 of hydrogen, and 49 of oxygen. Now these being the constituent elements of albumen and flesh and blood, wanting the *nitrogen* which these animal productions all contain in the proportion of 15 per cent.—this element it is obvious must be derived from the atmosphere, of which it constitutes 80 per cent. From which it is apparent, that the purpose of breathing, is not only the inhalation of oxygen in maintenance of the combustion which ensues upon it, but of nutrition also in the conversion of the vegetable into animal substance: and thus the use of four-fifths of the atmosphere which is generally regarded as of little purpose other than as a diluent to the remaining *one-fifth* of oxygen.

Purity and Freshness of the Blood essential to Health.—We come now to the conclusion—the result to be derived from the foregoing facts. It is clear, that as air and starch were the only materials furnished to the animal, which both grows and lives by their agency, the reception of these, or their elements, into the

system, with a view to their union in certain definite proportions, (producing albumen and blood, and developing in the process heat and electricity, the animating stimuli of all vital phenomena,) is the primary and fundamental process of life—which one and all of the functions of the system are subordinate to and dependent upon. It is clear, also, that these vitalizing processes and healthy nutrition must depend, principally or very largely, upon keeping the fountain clear, or, in plain language, the blood pure and fresh; the newly-formed blood furnishing, as we have exemplified in the development and growth of the chick, all the results pertaining to that of vital manifestation and of nutrition also.

Over-animalization and impurity of the Blood, the cause of decrepitude and disease.—The purity of the blood has doubtless been provided for in a great degree by the agency of the purifying organs of the body—which in the excretions of the liver, kidneys, and skin, fulfil these purposes; but I maintain, nevertheless, that in the multitude of things we receive into the circulation as constituents of our food and beverage, certain elements or particles often do find their way into the blood—useless or objectionable in kind—which are not thus eliminated; and that others in process of time may, by excess of animalization, disorder of some function, or other means, be also thus formed, and, as recrementitious matter, accumulate and pollute the blood, and thereby produce disease; and further, as objectionable and useless matter, occupying the vessels, prevent the accession and introduction of a sufficiency of new materials into the blood, and thereby become the cause of decrepitude and the infirmities of age, or, in other cases, premature debility and decay.

Renovating influence of Blood-letting.—If what I have said is correct, we have, in the renewal of the stream by blood-letting—which not only removes the bad, but facilitates the entrance of the good and fresh materials, (absorption both of air and of nutriment being increased in proportion as the vessels are emptied,) a most valuable means of renovating the system, and one which, if judiciously employed, bids fair, I am of opinion, to relieve, if not to restore to perfect health, a large proportion of the decrepit and incurable which are everywhere to be found. But it will be argued that bleeding is an unnatural practice. Before I reply to this objection, I shall adduce another reason or two for its adoption. In the former part of this work I have endeavoured to establish the principle—that the essence of every disease consists

intrinsically either in congestion of the blood-vessels, or in inflammation, or in the intermediate condition, or that of *irritation*; which principle, the various organic affections which I have adduced must, I think, most satisfactorily confirm. And further, it is a fact, with very few exceptions indeed, that whenever death takes place it is in consequence of the existence of one or other of these conditions of the blood-vessels, or the effects they have occasioned. Now with these facts before us, and the universally acknowledged success which attends blood-letting in inflammatory and congestive diseases, who can doubt of its being employed with great advantage with the intentions I have pointed out, which are not limited to the prevention of those affections of the blood-vessels, but extend also to their cure.

Bleeding not an unnatural Practice; far otherwise.—In reply to the objection, that bleeding is an unnatural practice, I maintain that it is not so, seeing the relief afforded monthly to the female system, by a process of an analogous kind; and women in the best health are those in general with whom the relief is most plentiful. And how critical the period, and how liable to disease they are, when it ceases to be thus with them! And again, the bleeding of the nose in youth, and in after life from the fundement by piles, are in both cases curative efforts of the system, and should always be so considered; and in proof of this, and the harmlessness of piles, I may mention a few facts not undeserving of notice.

Facts in proof of the utility and harmlessness of Blood-letting.—When in India, and in charge of a battalion of artillery, I observed that the inmates of the hospital were limited at all times to a certain number of the men, the rest enjoying a comparative immunity from disease. Now as they all fared alike in duty, in diet, and in every other particular, I thought that the cause of the exemption from disease on the part of so many was worthy of investigation. With this view I had the men paraded for inspection, when I found, to my astonishment, that those exempted from disease were, with very few exceptions, the subjects of bleeding piles. This afforded at once a satisfactory explanation of their exemption from disease—while the cure of the men frequenting the hospital constantly required the use of the lancet; and in many cases of acute disease, to the extent not unfrequently of four or five pounds or more! Inflammation of the bowels or liver, if not arrested within a few days of the attack, terminating very generally in mortification or abscess; and thus arises

the great mortality which prevails in India. From these diseases the men affected with piles were generally exempted. And for reasons of like character women in general enjoy better health than men do in India.

The newly-formed Blood the source of Life and Nutrition.—As another very striking instance in support of the harmless nature of blood-letting in moderation, and of the immunity which it often affords from disease, I shall mention the case of a distinguished officer of the Indian cavalry with whom I was acquainted, who appeared always in health, and was as full of fun and frolic as the youngest cornet of the regiment. Residing at his house for a few days, I could not help expressing to him my astonishment at the hearty meals he always made, and wonder how he could manage to enjoy health, and take his couple of bottles of beer every day. His reply was remarkably apt; “You will agree with me, Doctor, that a large expenditure requires a handsome income for its support. Well then, I never go to a certain place, which I regularly do every morning, that I do not pass half a pint of blood, having been the subject of bleeding piles for years!” This explained the matter: and taking the loss of blood he sustained at a fourth part of what he said, as people are generally apt to be deceived in respect to the quantity of blood they lose, it confirmed in my mind, what experience had long before taught me, that life and health are dependent more upon the elements of diurnal *accession* to the blood (and hence the prostration which succeeds the want of a meal to those in health) than upon those of the older portions of the vital stream, and that blood-letting in consequence, when practised with discretion, is not only a very harmless, but, with truth may I add, a very useful practice,—seeing that no natural outlet exists for the grosser and richer particles of the blood, when these become in excess, as I believe they frequently do*.

Renovating Influence of Air, Exercise, &c., conjoined with Blood-letting.—I have said that bleeding, if judiciously practised, may be advantageously employed, that is, in small quantity and at short intervals, in order that no direct debility may be produced by the operation—and continuing it, in conjunction with suitable diet, air, exercise, and such other remedies and app

* I am acquainted with an old lady—now in her 90th year, who is excellent health; but who some years ago, suffering from oppression and indigestion, was in the habit of losing a tea-cupful of blood every day; this she continued for many months.

ances (the hydropathic among the number) as the circumstances of the patient may especially call for in the renovation of his system. This leads me, in completion of the subject of renovation, to add a few remarks upon the practice of the Hydropathist, which, although condemned by many, possesses, in my humble opinion, much to commend, and much also that is in the highest degree valuable and deserving of adoption.

The Principles and Practice of Hydropathy.—The practice of this system comprises, in my opinion, two distinct and dissimilar intentions; and as they are both available to the purposes of renovation, and as I have on several occasions recommended a visit to an establishment of the kind, it is proper that I should impart what I know upon the subject. The objects to be fulfilled in one case, are—the blood's purification, and the reduction of any preternatural excitement of the system, or part of it. The other intention is, that of exciting and giving tone to the cutaneous function, and by consent of parts and continuity of surface, invigorating the function of the lungs and the abdominal organs, and in short, the entire system. The first of these intentions is fulfilled by increasing the secretions of the skin and the kidneys, by the agency of the lamp-bath in the first case, and other expedients described in a former chapter; conjoined with a well-regulated and efficient mode of applying hot fomentations to inflamed organs; followed up by the use of the shallow bath as an invigorating process after the relaxing effects of the former means.

Hydropathy in Gout, Rheumatism, &c.—The practice of eliminating the morbid matter by perspiration, conjoined with that of fulfilling the same purpose by increasing the urinary secretion—by drinking plentifully of cold water, must without doubt be an admirable method of treating gout, rheumatism, scrofula, and many cutaneous and other affections, dependent upon the presence of the salts of the urine and other depravities, as well as an inflammatory condition of the blood. In addition to the means mentioned, in relief of any local affection, a wet bandage protected from evaporation by a covering of some folds of a dry one surrounding it, is applied to the part affected, and which is thus kept in a damp state as it would be by a poultice, and worn throughout the day.

Hydropathy in general Debility, Dyspepsia, &c.—The second intention of the hydropathist, which is more particularly applicable to cases of general debility—and that large class of them

in particular known as nervous and dyspeptic, based upon our too luxurious habits of life, ceaseless anxiety, and excess of mental employ, added to insufficiency of exercise—is, as I before mentioned, effected through the cutaneous surface and consent of parts, giving tone to the system in general. This is effected by the agency of the shallow bath, the dripping sheet, the plunge, and sitz baths, followed as strength is attained by the falling douche, in combination or singly, as the condition of the patient or circumstances of the case may require.

The Systems of the Trainer and the Hydropathist compared.
—This, I think, will be acknowledged to be a fair representation of the practice of the Hydropathist of the present day, and it assuredly embodies principles which, if judiciously carried out, are of most useful application in the treatment, not only of the large class of affections previously adverted to but many others also; inasmuch as it in an eminent degree develops and augments all the natural powers of the system—and these are the only curative means in any case. The hydropathic practice, it will be well to observe, embodies in it the system of the trainer also—by which the bloated, ill-conditioned, short-winded sot, we know, may in a few weeks be changed to the firm-fleshed, healthy-skinned, long-winded, and courageous prize-fighter; which effects are in this case produced principally by increasing and developing the breathing powers by means of air and exercise, and thus burning out all the blood's grossness and impurities, adding at the same time to the muscular development and powers of the system; in short, doing that for the man, which might in like manner be done for the bloated pig—take him from his sty and make him, like the sheep, roam the hills in search of his food; and there, by the expansion of his lungs and the increased quantity of air imbibed into the system under active exercise, not only burn out by the absorption of an increased quantity of oxygen a portion of the surplus carbon and hydrogen (the elements of fat) which abound in his case, but convert into muscle or flesh other portions of the same, by adding thereto, and combining therewith, nitrogen—the other constituent element of the atmosphere, as in the case of the sheep feeding on the mountain range;—the sheep in the same manner as the chick, as before explained, thus converting starch—or the elements of its composition which it derives from its food, into its own substance.

The system of the hydropathist, I am however bound to say,

does more than this, as it includes, in addition to active exercise in the open air, the mind's repose, by abstaining from all active mental employ; with abstinence also from all exciting beverages, a plain wholesome diet of meat, bread, vegetables, fruit, and cold water, only being allowed, with early rising, and early return to bed; and last, though not least in amount of beneficial consequences, preserving the blood from contamination and further deterioration, by excluding physic altogether! or when the blood is so contaminated, or by other cause deteriorated, as we have previously spoken of as being the case in gout and many other affections, purifying and divesting it thereof, by washing out the impurity with cold water, and expelling it from the system through the agency of the skin and the kidneys.

Preissnitz highly deserving Commendation.—This system, I must aver in conclusion, embodying as it assuredly does, if not all the requirements of a complete system of treating disease, yet including so many pre-eminently useful principles, deserves most undoubtedly great commendation; and it is not only puerile, but discreditable, to say in disparagement of its author, although but a peasant, that he has taught nothing that was not known before; inasmuch as it is not what may be learnt, but what is practised by man, that constitutes desert; that in conclusion I must add—all honour to the immortal Preissnitz!

Utility of Cold Water as a Beverage.—I have further to add, that believing as I do, for reasons given in a former chapter, that the circulation through the liver and the excitement of the lacteal or nutritive absorbent vessels, are effected through the instrumentality of the oxygen which, as a constituent of the air, is absorbed from the surface of the stomach and bowels; and as cold water contains a large amount of atmospheric air—sufficient, indeed, to maintain the vitality of fish and other aquatic animals whose gills are exposed to its influence (and which air is expelled by boiling)—it speaks to every man's common sense, that cold water partaken of as the common beverage in exclusion of all such as have been boiled, and others (like soda-water, ginger-beer, and the like) containing carbonic acid, or spirituous and exciting qualities, must be an agent of much value, in all cases of torpor of the liver or of the stomach and bowels,—independently of the direct tonic influence of the cold fluid on the stomach, and associated organs, if used in moderation.

Rest.—As a remedial agent, rest, has not been sufficiently

appreciated, nor have I in these pages laid sufficient stress upon it: a little reflection will at once display its importance. The conservative principle—the *vis medicatrix nature*—which I have had occasion so frequently to point out—as being always at hand to subvert the malign influences in their operation on the system and throw off disease—and which I have said it was the duty of the physician to assist,—sometimes to moderate, but seldom to suppress;—well then, would we aid her, in what way could we do this so naturally and efficiently—than by placing at her disposal all the resources of the system?—than by giving rest to both body and mind—and thus reserving for her use the whole fund of electro-nervous power—that she may concentrate it upon the restorative processes? It is obvious therefore, as a remedial agent, great attention should be paid to rest—and in furtherance of it, the recumbent posture, which places many muscles at rest which would otherwise be kept in excitement, should be strictly enjoined; conjoined with the equable and comfortable temperature which can only be attained beneath the bed-clothes. With the same view, sleep should be encouraged, and every source of excitement—mental and bodily—be carefully avoided.

As a remedial agent, rest, I repeat, has not been sufficiently appreciated—we have shut our eyes to the fact so constantly occurring to us—that we go to bed ill, and by a night's repose, get up well in the morning! and I am sure, were we to act upon this knowledge—many is the ailment that might be thus cured—as evinced by the fact that strains and injuries of the like nature, which are all essentially inflammatory, are thus readily cured. Some months since I sprained my ankle, when by leeches and other appliances with a month's confinement it was apparently well; but being called upon to use it too soon—it became as bad as ever, and continued so for a length of time—when experiencing an attack of inflammation of the lungs, I was confined to bed for six weeks, from which I rose, to my great satisfaction, with my ankle quite restored, and which has continued so ever since. Indeed, there would seldom be any necessity for the doctor, were the early visitation of disease thus treated—would the individual retire to bed and there remain, confining his diet to food of the lightest and most simple kind. I would not however be understood to say—that I would not assist Nature, in any way it was self-evident—she might be so benefited:—and thus if the bowels were confined I would

give a little opening medicine, or if any of the secretions were suppressed, as they so constantly are by cold, assist her in restoring them—by some suitable remedy—as the pills advised in the following paragraph: or if there were pain in any organ, I would have it well fomented with hot water, and if this failed in affording relief, have some leeches applied to the part.

Domestic Purgatives.—In conclusion of this subject, I have only to add,—that although I deprecate the too prevalent practice of swallowing physic, and thus contaminating the vital stream, upon every trifling feeling of disorder—when in the majority of instances a day's abstinence or a little more air and exercise would effect all that is necessary; yet, as of two evils the least is to be chosen, so it is better to take a timely dose than suffer derangements to progress in the system, and complications of disease to ensue. And as the operation of all deranging causes and not the least frequent one—that of cold, is to depreciate the functions and active energies of the system, or disorder the secretions, and especially those of the liver and skin; as a general remedy, adapted to meet most cases, the following pill will be found an extremely useful domestic remedy; quite as efficient, more convenient, and much to be preferred to the usual doses of pill and black draught. This remedy is composed of twelve grains of calomel, with the same quantity of Socotrine aloes and Castile soap, made into twelve pills; of which one may be taken at night, or at other time when necessary. A single dose may be all that is required on ordinary occasions of confined bowels or other trivial derangement, or it may be repeated once or oftener as the circumstances of the case may require; or indeed, both night and morning in case of severe cold, or febrile affection. And although it may not be equal to the cure of every disease that may occur, it will do what is better, if timely resorted to, in conjunction with abstinence and general attention,—and that is, it will in most cases prevent any such occurrence taking place at all, or should it take place, prepare the way for more specific treatment.

THE END.



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